THE

FOUNDRY TRADE JOURNAL

WITH WHICH IS INCORPORATED

THE IRON AND STEEL TRADES JOURNAL.

VOL. 33. Thursday, May 27, 1926. No. 510.

PUBLISHED WEEKLY.

Subscription Terms: 15s per annum.
Foreign and Colonial, 17s. 6d. per annum.
All Subscriptions are payable in advance.

All communications to be addressed to the Editor, or to the Publisher, as the case may be, of

THE FOUNDRY TRADE JOURNAL,
BESSEMER HOUSE, 5, DUKE STREET, ADELPHI,
LONDON, W.C.2.

Telephone: 6611 Gerrard (2 lines).
Telegrams: Zacatecas, Westrand, London.

Contents.

	PAGE
No Material Change	365
The Foundry Exhibition	366
The London Convention	366
French Foundrymen's Association	366
The Moulding of Grooved Pulleys	367
A Useful Type of Publicity	368
The Institute of British Foundrymen	369
An Excellent Phase of Welfare Work	372
Tool Clubs	372
Publications Received	372
Sir Robert A. Hadfield on Industrial Conditions	373
Company Meetings	374
Iron and Steel Institute	374
Correspondence	376
Refrigeration in Engineering	375
Birmingham Industries Fair	375
A French Conception of Foundry Costing	376
Desulphurisation Experiments on Cast Iron	379
Standard Pattern Colours	379
Foundry Management, Organisation and Costing (I)	380
Trade Talk	382
Personal	382
Contracts Open	382

THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

Institute of British Foundrymen.
PRESIDENT, 1925-26: John Cameron, Kirkintilloch, near Glasgow.

LIST OF SECRETARIES—

General Secretary: W. G. Hollinworth, 38, Victoria Street, London, S.W.1.

Lancashire: T. Makemson, 21, Beresford Road, Gorse Hill, Stretford, Manchester.

Birmingham: H. James Roe, 33, Herbert Road, Bearwood, Birmingham.

Sheffield: R. Village, "Bircholme," Dronfield, near Sheffield.

Scottish: J. Bell, 60, St. Enoch Square, Glasgow.

London: H. G. Sommerfield, Charterhouse Chambers, Charterhouse Square, London, E.C.1.

Newcastle-on-Tyne: Colin Gresty, 93, Queen's Road, Monkseaton, Northumberland.

East Midlands: H. Bunting, 17, Marcus Street, Derby.

West Riding of Yorkshire Branch: S. W. Wise, 183, Moorside Road, Eccleshill, Bradford.

Wales and Monmouth Branch: J. J. McClelland, M.I.Mech.E., Druslyn, Bishops Road, Whitechurch, Glam.

Welsh Engineers' and Founders' Association.
Secretary: F. J. Griffiths, 20, Fisher Street, Swansea.

Foundry Trades Equipment & Supplies Association.
Secretary: K. S. Bridges, Avenue Chambers, Southampton Row, London, W.C.1.

No Material Change.

Foundrymen throughout Britain are asking whether it is the intention of the organisers of the International Foundry Trades Exhibition and the London Congress of the Institute of British Foundrymen to adhere to the programmes as arranged before the General Strike. They can rest assured that so far as ever possible these programmes will be adhered to, and the only alterations will be those which may be influenced by the continuance of the dispute in the coal mining industry. The various co-operating bodies have redoubled rather than relaxed their efforts. They have put themselves to all kinds of inconveniences to attend the numerous committee meetings. They have been animated throughout by the feeling that they would not disappoint the foundry public, and, their work accomplished, we ask the foundrymen of Europe not to disappoint those who have done so much voluntary work to ensure the interest of the visitors shall be best served. To give but one example: for the organising of the technical exhibit alone, at least 3,000 miles have been covered by the various members of the committee. It has had the benefit of the advice and experience of the heads of every research organisation which includes foundry work within its scope; the Universities of Birmingham, Sheffield, Manchester and Glasgow, and the principal practical foundrymen and works metallurgists in the London area. Surely common-sense will show that an exceptional opportunity has been presented for increasing real knowledge of the potentialities of the foundry industry, which no progressive foundryman can reasonably afford to ignore. While times are a little depressing, there is a real undercurrent of optimism in high financial circles which is sufficient to create excellent business conditions the moment the mining crisis is settled, as settled it must be, and this at an early date. From one point of view, the time of the London Congress is opportune, as no owner or manager can plead the excuse that he is too busy to leave the foundry, as the conservation of raw materials has already reduced the speed of output. Actually, we understand that the applications for tickets for the Conference are already higher than on previous occasions, but those who have borne the brunt of the work of organising so complex a function as a national assembly are obviously desirous of receiving a record attendance.

It needed not a little courage to decide to carry on with the organisation, and if the foundry public will only exhibit the same spirit, then a record Convention is assured.

Much has been heard of the technical exhibit shown at the Düsseldorf Exhibition, and we are pleased to announce that the German Foundry Owners' Association have kindly promised to loan the more outstanding of the exhibits. Additionally, the secretary of this organisation, Dr. Geilenkirchen, is also personally visiting the Exhibition. Other prominent visitors are Messieurs Leon Thomas and Gustav Masson, respectively presidents of the French and Belgian Foundrymen's Associations.

Finally, we ask the visitors, who so good-temperedly endured the recent inconvenience, to bear with the Executive Committee, if by *force majeure* an odd item of the programme has to be omitted, because of the withdrawal of facilities due to the national conservation of coal.

The Foundry Exhibition.

Amongst the firms who have taken space in this Exhibition, which opens a fortnight to-day, and will remain open for 10 days, are the following:—

Name and Address.	Stand	Row
ATLAS PRESERVATIVE CO., LTD., Deptford	3	D
BAGSHAWE & CO., LTD., Dunstable ..	2	D
BEECROFT & PARTNERS, LTD., Sheffield ..	9	E
BESSLER, WAESCHTER & CO., LTD., London	—	—
BOWEN INSTRUMENT CO., Leeds	—	—
BRADLEY & FOSTER, LTD., Darlaston ..	1	B
BRITANNIA FOUNDRY CO., LTD., THE, Coventry	5	E
BRITISH & CONTINENTAL TRADERS, LTD., Aldwych, W.C.2	13	B
BRITISH DRYING & HEATING CO., LTD., 432/3, Abbey House, S.W.1	1	G
BRITISH PIGIRONS, LTD., Abbey House, S.W.1	7	G
BROOM & WADE, LTD., High Wycombe ..	—	—
COLVILLE, DAVID, & SONS, LTD., 107, Old Broad Street, E.C.2	6	F
CONSETT IRON COMPANY, LTD., Consett, Durham	6	D
CORRIE, J. B., & CO., LTD., 15, Victoria Street, S.W.	—	—
CUMMING, WILLIAM, & CO., LTD., Maryhill, Glasgow	9	D
DAVIDSON, F., & CO., 29, Great Portland Street, W.1	5	F
DENBIGH ENGINEERING CO., LTD., THE, Tipton, Staffs.	7	D
EVANS, SYDNEY, 9, Bush Lane, E.C.4 ..	3	G
FORDATH ENGINEERING CO., LTD., THE, West Bromwich	10	D
FOSTER INSTRUMENT CO., Letchworth, Herts.	2	F
FOUNDRY TRADE JOURNAL	—	—
GENERAL REFRACTORIES CO., LTD., THE, Sheffield	10	C
GRAY, THOS. E., & CO., LTD., 119, High Holborn, W.C.1	5	D
GREENSLADE, E. A. & W., & CO., LTD., Bristol	—	—
HEARSON, CHAS., & CO., LTD., 27, Mortimer Street, W.1	10	F
INTERNATIONAL FOUNDRY EQUIPMENT CO., Birmingham	—	—
KEITH, JAMES, & BLACKMAN CO., LTD., 27, Farringdon Avenue, E.C.4	2	B
LILLESHALL CO., LTD., THE, Shifnal, Salop	18	F
MACDONALD, JOHN, & CO., Pollokshaws, Glasgow	14	F
MACDONALD, JOHN, & SON, LTD., Maryhill, Glasgow	—	—
MAJOR, ROBINSON & CO., LTD., Sykes Street, Manchester	3	F
MARLEY HILL CHEMICAL CO., LTD., 39, Lombard Street, E.C.3	8	B
MASTABAR BELT FASTENER CO., 14a, Blackfriars Street, Manchester	1	C
MONOMETER MANUFACTURING CO. (1908), LTD., 115–116, Strand, W.C.2	11	D
NICHOLSON, W. T., & CLIPPER CO., LTD., King Street, Salford	14	D
NOBEL INDUSTRIES, LTD., Buckingham Gate, S.W.1	3	C
NORTHS NAVIGATION COLLIERIES (1889), LTD., Bute Docks, Cardiff	5	B
OGILVY & CO., 20, Mortimer Street, W.1 ..	13	F
PNEUMATIC ENGINEERING APPLIANCES CO., LTD., Norfolk Street, London	—	—
PNEULEC MACHINE CO., LTD., Smethwick, near Birmingham	2 & 3	E
POWELL DUFFRYN STEAM COAL CO., LTD., THE, Cardiff	13	D
PRIESTMAN, T. J., Birmingham	—	—
RAPID MAGNETTING MACHINE CO., LTD., THE, Lombard Street, Birmingham ..	1	E
SISSON, LEHMANN, Charleville	—	—
SKYLUX, LTD., Great St. Andrew Street, W.C.2	—	—
SOMMERFIELD, H. G., Charterhouse Chambers, E.C.1	15	C
SPERMOLIN, LTD., Black Swan Works, Halifax	8	E
STERLING FOUNDRY SPECIALTIES, LTD., 13, Victoria Street, S.W.1	4	D
THOMAS & BISHOP, LTD., 37, Tabernacle Street, E.C.2	4	H
UNIVERSAL SYSTEM OF MACHINE MOULDING AND MACHINERY CO., LTD., THE, 97, Queen Victoria Street, E.C.4	6	E
WOLF, S., & CO., LTD., 115, Southwark Street, S.E.	4	C

The London Convention.

The following is the second list of subscriptions to the delegate entertainment fund which has been raised in connection with the forthcoming London Convention of the Institute of British Foundrymen. Subscriptions are still urgently required in order that adequate entertainment may be offered to the large number of important visitors who have already signified their intention of participating. Subscriptions should be sent to Honorary Convention Secretary, Mr. H. G. Sommerfield, Charterhouse Chambers, Charterhouse Square, London, E.C.4, or to the Editor of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, London, W.C.2.

Amount previously acknowledged, £252 5s.; William Jacks & Company, £26 5s.; William Cumming & Company, Limited,, £10 10s.; James Keith & Blackman & Company, Limited, £10; Fordath Engineering Company, Limited, £5 5s.; Augusts' Muffle Furnaces, Limited, £5 5s.; Ealing Park Foundry, £5 5s.; Southern Foundries, Limited, £5 5s.; Sterling Foundry Specialties, Limited, £5 5s.; Baker, Perkins, Limited, £5; Westoby & Rawstron, £5; Callenders Cable Construction Company, £5; Mr. Chas. A. Otto, £3 3s.; Petters, Limited, £3 3s.; Mr. J. W. Gardom, £3 3s.; Sir Wm. Larke, £2 2s.; Mr. Robt. J. Shaw, £2 2s.; Mr. F. J. Wares, £2 2s.; Mr. F. J. Cree, £2 2s.; Mr. L. Tibbenham, £2 2s.; Mr. H. Shannon, £2 2s.; Mr. J. Campbell, £2 2s.; Mr. A. C. Furmston, £1 1s.; Mr. A. F. Gibbs, £1 1s.; Atlas Preservative Co., Limited, £1 1s.; Mr. A. C. Eccott, 10s.; Mr. J. Teasdale, 10s.; Mr. A. Whiting, 10s.; Mr. A. R. Bartlett, 10s.; Mr. W. G. Underwood, 10s.; Mr. H. E. Hand, 10s.; Mr. J. H. Hotchkis, 10s.; Mr. G. C. Pierce, 10s.; Mr. H. H. Sanders, 10s.; Mr. B. Skidmore, 5s.; Mr. J. Dobson, 5s.; Mr. W. Fish, 5s.; Mr. A. Beardshaw, 5s.; Mr. F. H. Bennett, 5s.

IMPORTANT NOTICE.

On Saturday next, May 29, the Offices of "The Foundry Trade Journal" will be transferred from Duke Street, Adelphi, to 49, Wellington Street, W.C.2. The telephone number will be Gerrard 3951 (4 lines) and the telegraphic address, "Zacatecas, Rand, London."

French Foundrymen's Association.

At a general meeting of the Association Technique de Fonderie, held on May 19, in Paris, Monsieur Ramas, who has been president since 1921, has been elected Honorary President, in recognition of his long term of useful service.

Monsieur Leon Thomas, foundry manager to Citroën, has been elected president, whilst Messieurs Jean Derdinger, H. Magdelenat and E. Ronceray are to fill the office of vice-presidents. Monsieur Joseph Leonard, a past-president of the Belgian Association, is to be an honorary vice-president.

FOR THE FIFTH TIME Mr. J. B. Share, iron and steel merchant, carrying on business at Brierley Hill, Staffs, was examined in bankruptcy at Stourbridge County Court, before Registrar Collis recently. After a further long examination the matter was again adjourned to a date to be fixed.

THE GERMAN ASSOCIATION OF IRONFOUNDRIES, reporting on the market situation in the first quarter of 1926, states that the sales crisis in castings became aggravated, as compared with the final quarter in last year, and the prospects for the summer are said to be gloomy. Further restrictions in working and dismissals of men have had to be made, and short time resorted to in a greater measure. Under these circumstances, prices have given way almost everywhere, and in part have reached a very low level, so that profits are earned only in exceptional cases. On the other hand, wages have scarcely experienced any change, except that in some cases piece rates have been able to be reduced by from 5 to 10 per cent.

The Moulding of Grooved Pulleys.

By Eugene Ronceray (Hon. Mem., Inst. Brit. Foundrymen).

This Paper, read before the Association Technique de Fonderie, forms a subject of examination for candidates at the Ecole Supérieure de Fonderie.

The first question to be settled in moulding a grooved pulley is the arrangement of the various parts. This is the first means of judging of the candidate's general knowledge and his aptitude for carrying out independent work. It was found that certain candidates, in designing their pulleys, made the sections too flimsy to enable the parts to be cast uniformly, or which would be difficult to cast or cause too much scrap. Other students made the sections too heavy, which would considerably increase the cost of manufacture. Still others designed the pulley so that the angles were too acute, with the attendant risk of fraying the rope. A few of the candidates made the boss thinner than

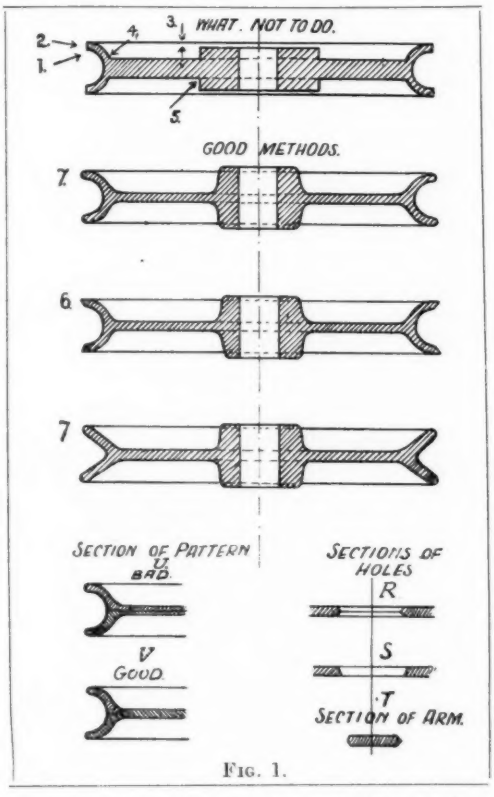


FIG. 1.

the rim, while others made a partial core-box, requiring two or three core segments, thus giving rise to fins in the groove.

After outlining the various defects in design, the writer considers the possible solutions of the problem.

Referring to Fig. 1, a number of important faults will be noticed, *e.g.*, the acute angle at 1, A pulley of this kind would fray the rope in service. Further, there is a sharp angle at 2, which, whilst not so serious, detracts from neatness. At points 4 and 5 also the sand angles will be too sharp and give unsatisfactory castings. It will be seen that the boss is thinner than the rim (3), so that when this pulley works in a cap the rim will rub on the sides of the cap. The boss and the web are thick in relation to the rim. This leads to a heavy and expensive casting. Below the wrong arrangement will be found one that is acceptable. In the latter case the edges are radiused, especially on the rope side, the thicknesses are practically regular, and the boss is better proportioned and wider than the groove. These forms satisfy the eye, and at the same time keep down weight.

One of the designs shows an acute outside angle. This arrangement has the advantage of bringing the joint outside (6) instead of having it on the rounded part of the rim (7). In making the pulley, it can be arranged with arms, or with a web provided with holes, or without these. This may be done in several ways, some good and some bad. If machine moulding is to be adopted, a hole may be made having taper in both directions, with a joint in the middle (R) (Fig. 1), the

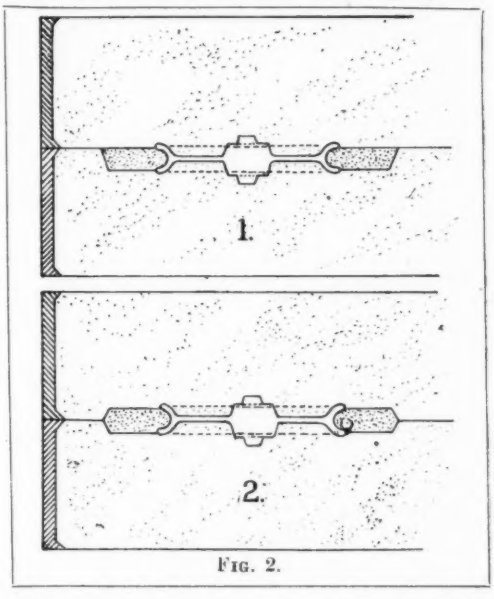


FIG. 2.

joint coming on to the pattern plate. Or all the taper may be arranged in one direction (S) (Fig. 1). If arms are provided, method (T) (Fig. 1) will be suitable, especially for machine moulding. This section of arm is very easy to mould.

For a pulley of the dimensions we are now considering (about 6 in. dia.), the arrangement suggested will do very well. For a larger pulley, it is probably desirable to have a radiused arm, but this does not make for easy stripping, as the sand angle at the joint is not sufficiently pronounced.

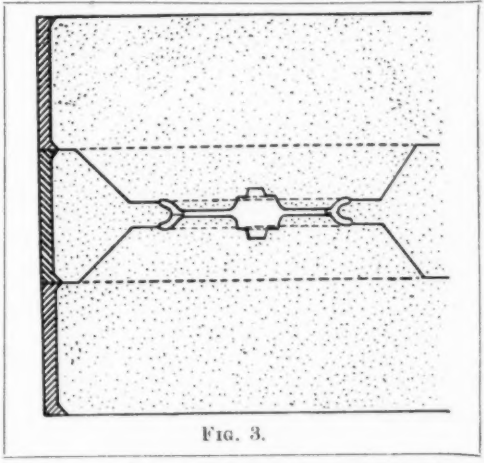


FIG. 3.

A section of the pattern is shown at (U), Fig. 1. The joint in the middle has obvious disadvantages. It is preferable to make the joint as shown at (V) (Fig. 1), leaving only an outer half rim free. This facilitates moulding.

Moulding with Dried Cores.

The core may be arranged as shown in Fig. 2 at (1), *i.e.*, wholly in the bottom part of the box, or else the core may be arranged so as to be half in the top and half in the bottom parts of the box,

as shown in Fig. 2 (2). Considered purely from the standpoint of moulding, both methods are equally easy of execution, but the core box is much more complicated in the second case, for the core-box in the latter case is difficult to make. On the other hand, when the mould is closed, there may be variations making closing a difficult matter. For these reasons, the arrangement in Fig. 2 (1) is preferable.

Using a Cope.

Fig. 3 shows the method of moulding with a cope. The arrangement of the drawing is fairly normal, because the width of rim is only 20 mm. (0.4 in.). Although this does not lend itself to moulding with a cope, the method has been included for completeness. The thinness of the pulley renders it necessary to have a slope to enable a box to be used that is not too thin. The same arrangement would obviously apply for a thicker pulley.

The solution involving the use of a cope is extremely simple, and there is not the slightest difficulty in adopting it. The crown method of jointing has been adopted in this case instead of cutting the pattern through the middle. The sequence of operations is as follows:—Ram or squeeze the bottom (if the pulley is large, the bottom is squeezed), ram the groove into the cope, ram the top, when the position will be as shown in the drawing. Lift off the top, withdraw the

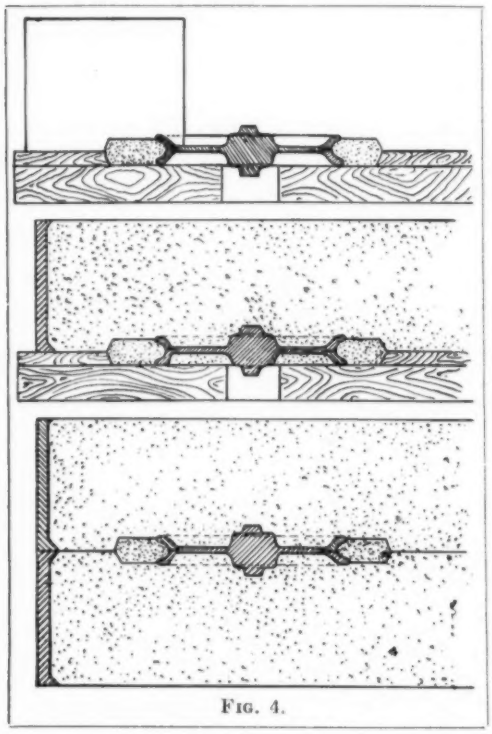


FIG. 4.

half-pattern, *i.e.*, half rims, lift off the cope or middle part, withdraw the rest of the pattern, close the mould again after having placed the core centrally.

Moulding in Two Parts of a Box Without Cope or Core.

The first operation is to place the pattern on a board (Fig. 4), and ram the groove, the bottom being cup-shaped. The sand is rammed into this to make a slope. The upper part of the rim and joint is now moulded with a scraper board. The top part of the box is rammed with the runner stick in position and the whole is turned over; the bottom is then removed, and the same sweeping operation is performed by removing the excess sand as far as the joint. The bottom half is rammed up, lifted off, and the half-pattern withdrawn. It will be seen that the pattern has been placed in the reverse position to that which it occupied previously. The main part of the pattern remains. When the boss is withdrawn, the bottom half is put back, and the top part is then raised, then the remaining part of the pattern, the central core is inserted, and the mould closed.

In a word: After forming the groove in position the operation is commenced by ramming the top half, and the pattern is only turned over twice. It is usual in the foundry to turn it over three times. It should be noted that if the pattern were joined as shown at (V) (Fig. 1), its weight, if made of metal, would break the groove when turning it over.

Moulding Without Cope or Core or Turning Over.

Assuming that a very large pulley is to be made, it might be desirable to print the bottom in the floor or even in a box. In these circumstances (Fig. 5), the mould would have to be made without turning it over. Supposing the bottom

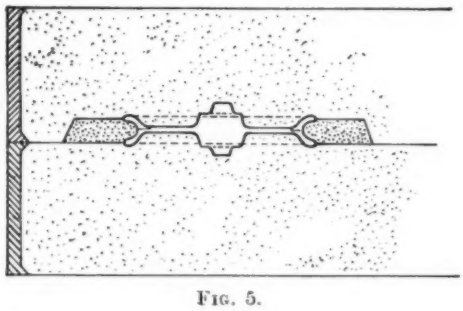


FIG. 5.

part has been moulded in the floor, the pattern will be inserted—only once this time—the boss will be placed on top, and the groove will be made by causing the outside of the mould to project. The top half will then be put on, the sand rammed; after which the top half of the box and the half rim of the pattern will be removed.

When this is done, the mould is gummed, the top half of the box replaced, the main part of the pattern remaining in the sand is secured, the top box is lifted off, together with the mass of sand, and the pattern that is supporting it; and the box and mould which have just been turned over are reinforced in one of the recognised ways, say, by sprigging. The pattern is then removed, and, after having inserted the boss core, it only remains to close again to get the complete mould.

(To be continued.)

A Useful Type of Publicity.

British and Continental Traders, Limited, of Astor House, Aldwych, London, W.C.2, have prepared coloured adhesive poster stamps stating that they are exhibiting at the International Foundry Trades' Exhibition, to be held at the Agricultural Hall from June 10 to June 19, in French, German, Italian, Spanish and "Belgian." We have added "Belgian," because in each case the colours of the country have been incorporated in the design. This commendable form of publicity will be used on the foreign correspondence of the London office and home correspondence of their various foreign agencies.

THE address of Piftin, Limited, foundry specialists, of 94, Moorgate, E.C.2, will be 8, Finsbury Square, E.C.2, after June 16.

THE Suffolk Iron Foundry (1920), Limited, of Gipping Works, Stowmarket, have appointed the British Oxygen Company, sole selling agents for their welding rods, namely, "Ferro-Silicon," "Super-Silicon," and "Sifbronze." The agency will include Great Britain, Northern Ireland, Irish Free State, India, Australia, and New Zealand.

FOR the second time in one week the premises of Messrs. T. L. Harding & Sons, Limited, iron founders, at Market Street, Torquay, were entered, and money and stock taken from the offices and showrooms. Entrance to the premises was obtained by the removal of a pane of glass from one of the office windows, and, by all appearances, the burglar or burglars had spent some considerable time in a thorough search of the premises.

The Institute of British Foundrymen.

LONDON BRANCH.

The Annual General Meeting of the Branch was held at the Engineers' Club, Coventry Street, Piccadilly, W.1, on Friday, April 30. Mr. Geo. C. Pierce (Branch-President) was in the Chair.

The Hon. Secretary's Report.

Mr. H. G. SOMMERFIELD (Branch Hon. Secretary) submitted his Annual Report to the Branch for the year 1925-26. Dealing with membership, he said that it stood at 178, as compared with 154 for last year. The increase consisted of the addition of 30 new members, transfers to and from the Branch, resignations and removals, and it was gratifying to the President that such progress had been made during his year of office. The change in the place of meeting, from the hall of the Institute of Marine Engineers to the Engineers' Club, had been justified by the increased attendance, but even larger numbers were hoped for, particularly when the Branch welcomed lecturers who travelled from a distance.

The forthcoming Convention, to be held in June, had made it necessary to conserve resources in the way of works visits during the past session, and in order that the Convention programme should not suffer, the Council had considered it the better plan to forgo Branch visits and to allow the Convention Executive a free hand in the choice of works to visit in June. All London Branch members would have equal facilities to participate in these works visits with other members of the Institute who attended the Convention.

Mr. F. J. Wares had been elected to the Branch Council, and Mr. Cleaver as an Auditor, in the place of Mr. H. J. Maybrey, who had held these offices prior to his removal to Scotland. Mr. R. J. Shaw had resigned the Treasurership of the Branch, and this office was now a dual one with the Hon. Secretaryship.

The illness of Mr. A. R. Bartlett, a member of the Council and a past Branch-President, was much regretted by all. (It was gratifying that Mr. Bartlett had recovered sufficiently to be present at the Annual Meeting.)

The audited accounts of the Branch for the year showed a credit balance of £50 8s. 6d.

On the motion of Mr. Hands, seconded by Mr. Shillitoe, the Report was adopted without discussion.

Election of Officers and Council.

The following were unanimously elected to fill the offices indicated:—Branch-President, Mr. R. J. Shaw; Senior Vice-President, Mr. W. B. Lake; Junior Vice-President, Mr. J. W. Gardom; Hon. Sec. and Treasurer, Mr. H. G. Sommerfield; and Branch Councillors, Mr. Shillitoe, Mr. Clark, Mr. G. Hall, Mr. H. C. Dews.

The London Convention and Exhibition.

Mr. H. G. SOMMERFIELD, as Secretary of the Convention Executive Committee, indicated the arrangements which had been made in connection with the Convention and Exhibition to be held in London in June, and Mr. WESLEY LAMBERT, as Chairman of the Technical Advisory Committee, made reference to the arrangements made for exhibiting castings, etc., of a non-commercial nature, but of general interest to the foundry trade.

A hearty vote of thanks was accorded Mr. Sommerfield for his services as Hon. Secretary of the Branch during the past year, and particularly for the great work he had done and was still doing as Secretary of the Convention Executive Committee. The vote of thanks was proposed by Mr. Shillitoe, seconded by Mr. V. C. Faulkner, and supported by the Chairman, all of whom paid a tribute to Mr. Sommerfield.

Foundry Topics and Problems.

The business of the Annual General Meeting having been concluded, an open discussion was held on foundry topics and problems. The idea emanated from the Branch-President, with a view to giving members of the Branch opportunities of bringing forward problems in the solution of which they had had difficulty in the course of their daily experience, and of seeking advice and help in their solution, or of advising and helping other members who might in the future meet with similar difficulties.

Mr. HOTCHKISS exhibited a small and rather intricate phosphor-bronze casting, containing a flaw, and said that two or three foundries had had trouble on occasion in the making of these castings. He stated that his foundry turned out about 400 per week, and the percentage of wasters was about 5, which covered machining and foundry scrap.

The casting was examined by the members.

Mr. A. R. BARTLETT suggested that the hole which was noticeable in the casting was a shrinkage hole, in view of the fact that there was a heavy section of metal in the centre of the casting. Also, it was probable that there had been no riser to form a head on the top of the casting.

MR. HORACE J. YOUNG suggested trying an open top casting. He had been concerned with the making of very complicated castings for Diesel work, where the foundrymen had tried almost every method of making a good casting, but had fought against the idea of making an open top casting in bronze, brass or iron. As soon as the moulder had found out how to make it, however he had adopted the method.

Hollow Pig-Iron.

MR. J. W. GARDOM exhibited a piece of pig-iron which had been charged into the top of the cupola in the ordinary way, and when picked out at the bottom was found to be quite hollow. The size was about 9 in. by 4 in. by 3 in.; the centre had disappeared, leaving a hollow shell about $\frac{1}{4}$ in. thick. He asked for an explanation of the phenomenon. The composition of the pig-iron was as follows:—Silicon, 0.75 (approx.); sulphur, 0.07; manganese, 0.35; total carbon, 3.5; and phosphorus below 0.2 per cent. The phosphorus content was not checked, but he was certain that it was below 0.2 per cent. It was somewhere about 0.1 per cent.

MR. V. C. FAULKNER said it was obvious that the skin of the pig-iron was so constituted that it was of higher melting point than the inside. He had been going to suggest that the material must have had a high phosphorus content, and that the phosphide eutectic had melted out. There were at least three cases on record, in the case-hardening of steel, where the phosphorus content had been found to be as high as 0.1 per cent. or more, whereas in the ordinary way it should be below 0.06 per cent., and this had been due to the phosphide eutectic having melted out from the iron of the case-hardening box, but no difference was noticeable in the shape of the box. Actually in this case he would suggest that either in the cupola or during the manufacture of the pig, the skin had been decarbonised, leaving it with a higher melting point than the interior.

MR. R. J. SHAW said that, in the course of three months' experience of melting iron in a crucible, he had watched the change of the condition of the pig-iron after charging, and invariably it had melted right down the middle. He had seen dozens of pieces of pig-iron in which the middle had melted gradually, leaving the skin behind, and if they were not disturbed they could be seen "bleeding" from the centre.

The BRANCH-PRESIDENT said that his experience of the melting of pig-iron in a crucible was similar to that of Mr. Shaw. He used a crucible for melting a very high phosphorus pig-iron, for special purposes, and could produce at any time a piece of pig-iron similar to that produced by Mr. Gardom, but not out of a cupola.

MR. SHAW was of opinion that the same thing would happen with any iron; the iron he had used had not a high phosphorus content.

MR. H. C. DEWS said he had noticed that small pieces of wood used for lighting the cupola had come out at the bottom at the end of the day in a charred condition, and asked whether any members had noticed it.

There was no reply to this question.

A Non-Ferrous Problem.

The BRANCH-PRESIDENT put forward a problem with which he had been faced in the casting of a patented aluminium alloy, a problem which still existed to an extent, although he had achieved a large measure of success in overcoming the difficulties. He felt justified in saying that the production of castings in this particular alloy—castings which were mechanically sound and free from defects—was a difficult proposition for anybody with no previous experience of the alloy, despite the fact that one might have had experience with other aluminium alloys. He produced a casting made of this particular alloy. It was described as a plain, simple job, almost a flat plate, but he pointed out that he had produced 22 of them before he had produced a sound one, and had tried about 22 different methods of casting it. It was not a case of guessing at temperatures, because the work was carried out under pyrometric control, and there was a careful system of working the alloys. The pattern had been sent to three other foundries, but none of them had produced a perfect casting, so that the trouble was not due to a fault common to one particular shop or one particular system of working. The first casting he had made looked quite perfect, but when machined it was found to be full of oxide and gas holes. Different methods of running, and different temperatures, were tried, but the same result was obtained. Eventually he had had to adopt a method by which an enormous amount of metal was used. In the production of the casting exhibited, which he considered perfect, and which weighed about 3½ lbs., about 14¾ lbs. of aluminium was used, so that it was expensive. The only method of running by which he could make the castings successfully was to use two direct down sticks, make a channel across the casting, run into the bottom with a horn runner, and smother the top with risers. The casting was run flat. He had tried open top casting, but without success. The alloy was a very important one, and was used for very high-class work. The first factor of importance in the production of these castings was to see that the mould was rammed correctly. That sounded very simple, but when one had a shop in which a number of alloys, as well as ferrous metals, were dealt with, and when one had to change the men about from one side of the shop to the other and from one class of work to another, it was not easy to get them to adapt themselves to the various classes of work. It was important that the ramming for the castings to which he referred should be soft. He first became acquainted with aluminium in a very large shop in which motor castings were produced, and during the whole time he was working there he had neither used a vent wire nor had he seen one used, but he had since been convinced that the use of a vent wire in aluminium work was almost as essential as in other classes of work, although previously he had held that it was not necessary.

It was also extremely important to get the metal into the mould quietly. Those with experience of producing intricate castings in aluminium alloys would appreciate that it was impossible to pour the metal into the mould quietly when the thickness of the castings was of the order of 0.15 in. or less, but it was possible in the case of a casting of the thickness of the one he exhibited (about 2 in.). The particular alloy with which he was dealing created its own oxide merely as the result of agitation, and if it were simply stirred the oxide would be created. Naturally, therefore, no matter how carefully the metal was skimmed, if it were poured into the mould at any speed, or if there were anything in the mould, such as cores or projecting pieces, to stop the flow of the metal, oxide was created. He had formed the opinion that it was practically impossible to make a casting in this particular alloy without the formation of oxide unless one was prepared to smother the job with risers, as he had done. The metal had a freezing point of 645 deg. C., and a test was called for 11 tons per sq. in. tensile and 5 per cent. elongation, when bars were required.

As to the best possible means of getting the metal into the mould quietly, he said he had found that a by-pass runner was very useful. The diameter of the top of the horn runner was about ⅝ in., and about ¾ in. at the point at which it entered the mould. He believed that the first run of the metal created quite a lot of oxide, which was sent straight across the inlet and came out on the other side.

Test Bars.

Dealing with test bars, he said that sometimes a bar was called for from off the castings, but other times for 1-in. dia. bars cast separately. It was surprising to him that the people who asked for test bars did not try to obtain a little more practical experience in their production. That, of course, was the foundryman's point of view, but in his experience those who laid down the methods for producing the test bars usually stipulated about the worst possible methods of producing them, and while he did not say that it was imperative to produce the bars by the methods required, it was certainly very difficult, for the simple reason that, when pouring a test bar direct from the top, oxide was created, which did not rise to the top. He had seen bar after bar pulled, and it was found generally that they failed at an oxide fault. He had a record of a group of about six, poured direct from the top, and of those only two were successful, but when he had made the bars in a manner which in his view would produce the best results he had not had a single failure. When he was told he had to produce a chilled bar sufficient for turning a 0.56-in. bar, he had made a chill of about the correct dimensions, a three-sided chill, which gave a bar about 1-1/16 in. square after finishing. He had run it in at one end with a by-pass runner, and had placed a riser, approximately ¾ in. by 2 in., right over the middle of the bar, which was the part subjected to tension when testing.

It was suggested by MR. HOTCHKISS that good results might be obtained by casting one long girder with a cross-section having the shape of the castings required, which could be cut into a number of castings of the required thickness. The BRANCH-PRESIDENT replied that that might be possible if one had the facilities to do it. He also pointed out that the machining limits were small. Originally there was a machining limit of 0.07-in., but in response to his request it had been increased to 0.1-in. He had tried using a riser which was the full length of the casting, with the exception of the cross pieces at the top and bottom, and as wide as the casting, and with a head 7-in. high. That, he suggested, pretty well represented Mr. Hotchkiss' point of view. MR. HOTCHKISS agreed that it did, except that it meant losing metal each time, whereas, if a girder were made and castings were chopped from that, it meant losing only a machining cut.

Replying to questions as to the nature of the oxides formed when casting, he defined them as conglomerations of slag. It was similar to the dross which accumulated on the top of a crucible. It was pointed out by MR. H. J. YOUNG that it was exceedingly difficult to oxidise liquid aluminium, so far as he knew.

Continuing, the BRANCH-PRESIDENT said that no de-oxidiser was used, and the makers of the metal stated that no de-oxidiser was required. It was simply fluxed with sal-ammoniac. The colour of the oxide produced was usually a very dark brown. Silicate was present.

MR. YOUNG said there was more than one way of making an open top mould. It was not necessary that the metal should be open to the air, but the mould could be made so that the metal did not touch the top of it. That was met with particularly in connection with the use of hot moulds, and abroad hot moulds were used not only for casting iron, but also for brass and many other metals.

The BRANCH-PRESIDENT said he had tried using a hot mould, with large risers. He had also tried washing and drying, which was something he had never tried before with aluminium, with a view to eliminating the steam or gas generated from the mould, but that was a failure.

Replying to further questions, he said he had tried casting on edge instead of on the flat.

It was suggested that, owing to the peculiarities of this particular alloy, and the care which had to be exercised in ramming, one or two men

should be trained specially to cast the alloy, because if the men were changed about from one job to another good results could not be obtained, inasmuch as no two men rammed alike.

The BRANCH-PRESIDENT replied that it was difficult to do that in the particular circumstances in which he was working; obviously, he would do so if he could.

Mr. YOUNG said that in the course of some experiments some time ago he had bubbled pure oxygen through liquid aluminium, but had never discovered any trace of the oxidation of aluminium under such circumstances. He believed that the scum taken from aluminium, and which was sometimes said to be oxide, had been used for making hydrogen gas for the purpose of filling balloons, which proved that it could not be oxide.

Replying to further questions, the Branch-President said he had used only two kinds of sands, *i.e.*, the best Mansfield sand and Charlton sand, in making up the facing sand, and had varied the quantities of each of the two kinds of sand used in the mixture. He had also tried Mansfield sand alone.

Mr. F. A. T. BUCKINGHAM asked if the metal had been strained before pouring.

The BRANCH-PRESIDENT said he had tried straining through a strainer of about 1⅛-in. dia., containing five strainer holes, each of about 3/32-in. in dia.

Mr. BUCKINGHAM, referring to some aluminium pistons he had made, said the metal had been strained into the ladle, and skimmed again before casting. The metal was heated to a temperature of about 650 deg. C. The general thickness of the castings was about 3 in.

The BRANCH-PRESIDENT, replying to questions, said he had tried calcium chloride as a flux, but it had not been successful in overcoming his difficulties. He had not tried tallow candles, as suggested by one member.

The metal was melted in a crucible, and the fuel used was coke, in pit fires. The pots were not made of iron, but of American graphite. It was pointed out by Mr. Faulkner that a new pot gave better results than an old one for aluminium, but the Branch-President pointed out that the pot was new when he first began to make the castings. The successful casting which he produced at the meeting was poured at a temperature of 658 deg. C., and when it was suggested that that temperature was rather low he replied that he had tried a whole range, and had reached 800 deg. C. He had introduced chills, and, in fact, had smothered the casting with them. The strange thing was that this particular metal would take very kindly to chilling. With chills he could obtain quite a good casting up to a certain depth, but not to the depth he required in this case. The temperature of some of the chills was about 720 or 730 deg. C., but he had tried quite a range. He did not cover the metal with charcoal; it was merely fluxed with sal-ammoniac.

Disinfecting Sand Blast Helmets.

Mr. V. C. FAULKNER introduced another foundry problem, concerning the disinfecting of sand-blast helmets. He pointed out that the new regulations with regard to the cleaning of castings laid it down that sand-blast helmets should be disinfected. The helmets, however, were made of leather, and he asked what was the best method of disinfecting leather without destroying it.

Mr. H. G. SOMMERFIELD (Branch Hon. Secretary and Treasurer) said he believed that the best helmets were made of impregnated canvas and not leather. Each helmet had an air-supply tube, and was used by only one man. It had been approved of particularly by H.M. Chief Inspector of Factories, and he believed that the inspectors throughout the country had expressed a good opinion of it.

Mr. A. H. MUNDEY said he would not hesitate to use any ordinary disinfectant, such as the sprays which were in common use. Leather was not badly attacked by the ordinary light disinfecting agents.

Mr. FAULKNER pointed out that leather needed a long time to dry. Also, he had been told by a medical practitioner that the only thing to do would be to fumigate the helmets with iodoform.

Mr. MUNDEY said that the result would be so unpleasant that no one would wear the helmets, although, he believed, the troops had had to wear helmets treated in that way during the war.

Mr. WESLEY LAMBERT asked if the disinfecting regulations applied only to helmets which were not fitted with air-supply tubes.

Mr. SOMMERFIELD said he believed different regulations applied to helmets with and without air-supply tubes.

Mr. LAMBERT said that a circular had been promulgated, stating that it was imperative to fumigate or disinfect sand-blast helmets at regular intervals, and it was necessary that a certificate, to the effect that this had been done, should be produced. If canvas or leather were wetted, and then dried, however, they became harsh on the surface and lost their shape, and the wearers complained that the helmets chafed them. He had heard that formaldehyde had been used, but the effect of it was to perish the leather and produce cracks, and he did not know of any satisfactory disinfecting agent.

Vote of Thanks to Retiring Branch-President.

At the conclusion of the discussion Mr. V. C. FAULKNER proposed a very hearty vote of thanks to Mr. Geo. C. Pierce for the cordial manner in which he had presided over the gatherings of the Branch during the past year, and for having so ably conducted its business.

Mr. H. G. SOMMERFIELD, who seconded, said that he had very much enjoyed the privilege of serving as Branch Hon. Secretary under Mr. Pierce. The Branch had been very fortunate in having him as President, and he (Mr. Sommerfield) looked forward to the time when Mr. Pierce would fill an even more important office in the main body of the Institute.

The vote of thanks was accorded with acclamation, and, after the Branch-President had briefly responded, the meeting closed.

NEWCASTLE BRANCH.

The annual general meeting of the Newcastle Branch was held in the Neville Hall, Newcastle-on-Tyne, on April 24, 1926, Mr. M. B. Herbst presiding.

Election of Officers.

On the proposal of Mr. Herbst, and seconded by Mr. James Smith, Mr. E. Wood, B.Sc., was unanimously elected Branch-President for the coming session, whilst other appointments were as follows:—Senior Vice-President, Mr. V. Stobie, A.M.I.E.E.; Junior Vice-President and Hon. Secretary, Mr. Colin Gresty; hon. treasurer, Mr. H. F. Parsons; assistant hon. secretary, Mr. F. Sanderson.

A ballot for three delegates to the General Council resulted in Mr. J. W. Frier and Mr. J. N. Simm being re-elected, whilst Mr. F. Allan was chosen to fill the position vacated by Mr. H. J. Young, F.I.C., who had transferred his membership to the London Branch. Also by ballot, Mr. J. N. Simm and Mr. A. H. Tait were made members of the Branch Council, the latter being re-elected.

Mr. S. E. Smith and Mr. J. D. Nicholson were appointed as reception officers and Mr. F. C. Spencer as hon. lanternist.

Vote of Thanks to Retiring Officers.

On the motion of Mr. J. W. Frier a hearty vote of thanks was passed to the retiring President and officers for their valuable work during the session, and a suitable reply was made by Mr. Herbst.

In taking the chair, the new President made a few remarks in which he drew special attention to the forthcoming annual Convention which was to be held in London, and expressed the hope that a large number of members of the Newcastle Branch would attend. He also announced that the Newcastle Branch would have a summer outing in July.

Mr. Wood will deliver his Presidential Address at the first meeting of the winter session, *i.e.*, in September, which is to be the rule of the Branch in future.

XUM

Annual Report.

The annual report stated that the Branch had a total membership of 232, a decrease of six since the previous report. One subscribing firm, one member, four Associate members and seventeen Associates had been elected; losses by resignation and transfers to other Branches (notably to the Branch formed recently at Middlesbrough) numbered 29.

The branch has held eight meetings during the session, the average attendance being about 100. Also the following visits had been paid :— The Marine School of South Shields, the Engineering Department of Armstrong College, Newcastle-on-Tyne, and the works of the Northern Press and Engineering Company, Limited, South Shields, and the Birtley Iron Company, Birtley.

The annual dinner of the Branch was held on February 13 at Tilley's Restaurant, Newcastle-on-Tyne. About 80 members, ladies, and friends attended, the Lord Mayor of Newcastle and other distinguished guests being present.

Award of Diploma, etc.

Mr. J. W. Frier (Past-President, 1924-25) was awarded a Diploma by the General Council for his Paper on "The Use of Chills in Marine Engine Castings," which he read before the Branch in February, 1925.

Messrs. F. Charlton, J. P. Rowan, J. E. Harle and E. C. Smith were the successful candidates in the 1924 John Surtees Memorial competition, the prizes being presented by Mr. J. D. Carmichael (chairman of the Local Governors) at a meeting of the Branch held on September 26.

THE JUNIOR SECTION.

The Junior Section has had four meetings during the session, at which papers were read and members have also had the privilege of visiting the Leamington Glass Works, Scotswood, and the Redheugh Gas Works of the Newcastle and Gateshead Gas Company. The annual smoking concert, which was held in December, proved a great success, the attendance being about 60.

Mr. C. R. Van der Ben, of 169, Dunsmuir Grove, Gateshead-on-Tyne, was elected hon. secretary of the Section, in succession to Mr. W. P. Gospel, when the latter resigned owing to his leaving the district.

The thanks of the Council to Mr. H. J. Young, F.I.C. (Past-President), for his work on behalf of the Branch and the Junior Section were recorded. Mr. Young left the district recently to set up in private consulting practice in London.

Moulding Without the Use of Chaplets.

Following the business meeting, Mr. James Smith (Past-President), of South Shields, gave a lecture on "How to Make a Double Crown Cylinder Without the Use of a Chaplet." The lecturer illustrated his remarks by means of lantern slides, and also, by the aid of adjustable spindle and nuts, he explained how it was possible to fix the core and the grates without the aid of chaplets. He remarked that it would be a great relief to the engineer, and also to the foundryman, if the use of chaplets could be eliminated in the case of every casting, no matter whether it was a double crown cylinder or any other kind of casting.

He agreed that it was probably a more costly method than the present-day one, but he was dealing with the subject from the point of view of safety.

An Excellent Phase of Welfare Work.

Mr. E. J. Fox, the managing director of the Stanton Ironworks Company, Limited, has presented certificates to 265 veterans who have been employed for a minimum period of 40 years. The record is held by an employee with 62 years' service. At each of the various centres the men were entertained to dinner in company with the members of the Employees' Works and Welfare Committee. Mr. Fox, in presenting the certificates, said he hoped that the younger generation would follow the good example set by their elders and settle down to honest hard work—a life which had obviously been led by those to whom certificates were being presented.

Tool Clubs.

Time was when the apprentice patternmaker could get through his apprenticeship on an expenditure, for tools, of two or three pounds. In those days the average tool kit was probably not worth more than £15. Edge tools, even the much-used paring chisel, last for a few years, and breakages and losses are not frequent. Generally speaking a good kit of tools means better work and greater pleasure in doing it; therefore, in some districts, patternmakers form clubs which enable them to include relatively costly tools in, financially, a comfortable way. There are few patternmakers who do not desire a comprehensive tool kit.

There has never been a time as propitious for tool clubs as at present. We live in a period of high costs, when it is exceedingly difficult for workmen to obtain tools. There is a bigger market for wood-workers' tools just now than ever before. Few tools have been bought during the last few years, therefore kits are badly in need of replenishment, and especially is this true of edge tools. Planes, gauges and rules do not wear out, but chisels, gouges and plane irons do.

The obvious way to supply the demand for tools is to develop the club system. The writer knows some retail shops that do a very big business of this kind, and they have practically no bad debts.

A wood-worker's kit, in pre-war days, would cost anything from £10 to £20, but it costs much more now, and there is so little money to buy with, consequently men work with the minimum of tools. The average journeyman does not spend more than £1 or £1 10s. per year on tools; he probably cannot afford to do so because it is necessary to pay a lump sum. There are many men, however, who are ambitious to possess good tools, and they are generally very willing to pay a shilling or two shillings a week to obtain them.

The tool club is usually organised by a man with initiative, who, desirous of having a good kit of tools himself, and with some interest in his fellows, devises an easy payment system. This man collects the money each week from the club members, and he obtains tools to the value of the money collected. The men draw for places. When the system has been started in a large shop it generally carries on for a long time.

The club system does not cost the dealer anything; he may make a present to the man who collects the money, at intervals, but men are usually only too willing to do the small amount of work entailed without any thought of gain. An important feature of the system is, as has already been said, that there are no bad debts; the goods are handed over when the price is paid, and it is sometimes worth the dealer's while to reduce prices, because it is easier to sell tools through a club than otherwise. Price reductions on the more expensive tools are appreciated, and are a big inducement to men to carry on with clubs.

Good value must be given by the retailer, because the continuance of the tool clubs depends on goodwill. The quality of tool obtained through clubs is always of the highest.

Publications Received.

The Royal Technical College Metallurgical Club Journal, No. 5. Price 2s. net. Published by the Metallurgical Club, Royal Technical College, Glasgow.

Commercial Motor Vehicles Operating Costs.— The Editor of the "Commercial Motor" has placed at the disposal of our readers an 8-page pamphlet containing tables which give the average operating costs to be associated with all types of delivery vehicles from the side-car to the 7-ton lorry. They are based upon costs prevailing last month. Requests should be addressed to the Editor, the "Commercial Motor," 7, Rosebery Avenue, London, E.C.1.

"**Report on the Economic Situation in Belgium**," by J. Picton Bagge. Published by H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2. Price, 4s. net.

Sir Robert A. Hadfield on Industrial Conditions.

It is sometimes claimed, though not by the firm itself, that Hadfield's, Limited, is the largest steel foundry in the world. In any case, it is certainly the largest in Great Britain, and its welfare is of prime importance to the foundry trade. The speech of its chairman, Sir Robert A. Hadfield, F.R.S., delivered at the annual meeting of the shareholders of the company, is therefore of special interest to all other producers of castings. Now that the Hadfield concern control Messrs. A. Harper, Sons & Bean, Limited, they are now also ironfounders of onsiderable importance, and one can presume that effective co-operation will be established between the research departments of the two organisations. This should be all to the good of the Bean car in particular and the technique of cast iron in general.

Dealing with Low Prices and Competition, SIR ROBERT said that the cutting of prices by their competitors, some of whose results in their balance sheets show what little advantage accrues to them by obtaining orders below cost price. No firm is perfect, but at any rate Hadfield's had tried to carry out a policy of live and let live, also as far as possible not to undertake work at less than cost price. Their costing system was a specially efficient one, and enabled one to know just what we are doing.

He knew of one case with regard to a firm in whom we have subsidiary interests. Its managing director is a particularly hard worker, and in regard to a certain contract he told me he sat up several nights scheming out how to cut down his costs to the lowest possible figure. He presented his tender, and was finally told it was rejected because one of these firms—and they are one of his competitors who have paid no dividend for some time past—finally undercut him on a contract having a total value of about £44,000 by no less than £7,500. The tenderer must have known that his price meant a dead loss, that is, if their costing system was in order, of at least £5,000 or £6,000.

With firms who carry on business of this character I am sure no one has any sympathy when they get into low water. I suggest in all good faith that some of our competitors would be more wise if they did not quote below cost. To obtain orders under their cut conditions means that much work is of no value from the profit point of view.

On this question of competition, the world is in a powerless condition at present. One reads of Belgium underselling British steel in South Wales. In the United States, Belgian and German pipe founders are laying down pipes in American cities. British pig-iron is going to the United States in quite large quantities, and so on in other directions.

Horse Power per Employee.

Not long ago I saw a statement in the "Daily Mail" bearing upon the recent Trade Union Mission to the United States, that at the elbow, so to speak, of every workman in that country was placed 1½ horse power, that is, in addition to his human energy much use was made by him of "machinery energy."

As the point seemed quite an interesting one, I had an analysis made of the power available and used in our own works, including electric, steam and hydraulic power. This showed actual manufacturing machinery, exclusive of rolling mills and presses, yielded 4.5 h.p. per man, whilst for transport and lifting appliances 2.3 h.p. per man were available.

The above has been prepared in view of the statements being made with regard to the power used in the British as compared with the American.

It will thus be seen that the worker at Hadfield's is not short of power, and that we compare most favourably with the latest and best American works. Unfortunately, in one sense there is too much horse power available, that is, we want to distribute over more workers this total available power.

It will thus be seen that whilst to-day the United States shows the highest mechanical power development of any nation in the world, we in this country are not lacking in considering the importance of the use of machinery. It is almost an axiom nowadays that the wage scale of each nation is directly proportionate to its developed horse power. Increased wages and properly organised establishments mean bigger output, and in the end lower cost.

In the past, probably not now, it has been argued by the less far-sighted of the union leaders that increased use of machinery meant less distribution of employment. This has proved to be a fallacy.

Surely there never was a better example of this than the extraordinary high output per man during the war, showing the effects of specialisation of such work which unfortunately nowadays cannot be repeated to the same extent because orders are far too scanty.

Take our own case. One year we are working specially on a particular kind of work. Next year that has disappeared and something new has come forward to take its place, requiring new specialisation and re-arrangement of plant and machinery.

Exports of Iron and Steel.

Just as an example I may mention that during the month of March this year the production of steel alone in America amounted to the very high figure of 4½ million tons, or at the rate of 54 million tons per annum. I do not believe that the following statement has yet appeared in this country in the form I now present, and I think the figures will be of great interest.

EXPORTS OF IRON AND STEEL
(in thousands of tons).

	1913		1924		1925	
	Tons.	%	Tons.	%	Tons.	%
United Kingdom ..	4,969	34	3,851	39	3,731	30
United States ..	2,907	20	1,711	17	1,685	13
Germany	6,301	42	1,559	16	3,212	26
France	628	4	2,818	28	3,861	31
	14,805	—	9,939	—	12,489	—

The above gives us some assurance that Great Britain has not gone down the hill; in fact, the previous year, 1924, our share was 40 per cent., or, in figures, 3,800,000 tons of exports.

The leading factor in the change is our great ally, France, who is rapidly coming to the front. This is due partly to a newer and better position she has obtained as a result of the war, including the rightful restoration to her of her old provinces, Alsace-Lorraine.

Conditions in Russia.

Mr. Walter Runciman, M.P., has pointed out there were no less than 16 million British capitalists, or about two in every five persons, also that no less than £1,750 million stood in the names of about 16 millions of people in the Post Office Savings Banks, Trustees Savings Banks, National Savings Certificates, small Government holdings, Insurance, Building Societies, and so on.

When strikes and lockouts are before the nation, these small investors are surely entirely overlooked. It is they who represent the backbone of the nation, and no investor wants to see cessation of output, which means depreciation of his investments and less opportunity for saving. It is only the communist of the world who wants to pull down instead of building up. A better instance of this could not be shown than the following.

I hope that the terrible indictment against the Russian Government, for such it is, will travel far and wide with regard to the policy of those who are supposed to govern the lives and fate of some 150,000,000 of the world's inhabitants. Certain statistics which have come to hand regarding Russia go to show only too clearly the pitiful condition in which the communications of Russia, both rail and water transport, have been reduced by wholesale nationalisation. There is not a man outside Russia, and surely even there, too, who could ever want to continue this utterly impossible method proposed by the Soviet

Republic for transforming society and superceding what they term the capitalist system.

The People's Commissar for Transports in Russia himself says that their services are nearly worn out. All over Russia there are to be found "cemeteries" of ruined wagons, "cemeteries" of locomotives, rust-covered and useless, and "cemeteries" of boats and barges rotting at their moorings. Such is the result of nationalisation run riot.

To give some idea of the collapse of transport methods, in 1924 goods transported on Russian railways were exactly one-sixth of the pre-war tonnage. Imagine such a state of things in this country, and what would be the chaos, misery and ruin staring everyone in the face.

On January 1, 1926, about half the wooden sleepers employed on Russian railways to carry the steel rails had exceeded their limit of service, after which the rails could only be used subject to rigid precautions, such as reduction of speed and restriction of the weight of trains. The station buildings and the bridges are not kept up and are in a dangerous state. These are not hearsay statements, but facts. According to the "Ekononitscheskaya Zhizn" of April 26, 1925, the managing director of the Moscow-Karan Railway said at a congress of railway managers: "The permanent way and equipment are at present in a critical condition."

As regards passenger carriages on the railroads, out of 25,300 formerly in use there are now less than half these fit for service. In fact the quantity is so insufficient many passengers have now to be carried in goods trucks. Such are the terrible conditions in Soviet Russia under nationalisation.

Co-operation Between Employer and Employed.

That there is better feeling between employers and employed in America is illustrated by some remarks made by Mr. Charles F. Schwab, Chairman of the great Bethlehem Steel Company. He said that "Peaceful relations between capital and labour will contribute impressively toward national economy." He also added "there is now prevailing a healthier and happier relationship between employers and employees in this country. With these two sitting down to discuss their common interests together, we find a condition to justify enthusiasm over the future." Cannot we have these same objects in view over here. The great text, written in living fire, should be "Co-operation between Employers and Employed."

American Wages.

It is not quite certain as to whether some of the high wages paid over there are not being effected at the expense of some other sections of the community. In this connection I will quote from an article entitled "An Economic Epitome," which appeared in the "Iron Age," of April 8, 1926. The writer had in mind the question of the high wages paid in America, and apparently "All is not gold that glitters." This article shows, and I am quoting the writer's own words, that "the high wages some classes enjoy are therefore only partly drawn from increased productivity; in large part they are drawn from other classes of workers." This is indeed important news. When one ventures to ask who are the classes who are most certainly not sharing in the glowing pictures which are painted to us from time to time about wages in America, it appears that it is the farmer "who has no union to produce protective restrictions. On the other hand, he does not want to be guided and managed, preferring to live his own independent and inefficient life. He suffers from other conditions that need not be re-summarised here. It is sufficient to say that he is the victim upon whom others fatten."

Italian Labour Scheme.

I have been much struck with the very able article by Signor Luigi Villari which appeared in the "Daily Telegraph" last March, "The Fascist Scheme for Industrial Peace," and describing Italy's new law which safeguards the public. The Italian Government has now provided for the establishment of compulsory jurisdiction. Workers and employers can in Italy no longer take matters into their own hands, for both strikes and lockouts are declared illegal. Penalties are imposed for the breakage of the law. If this law succeeds, it will have solved one of the greatest social and economic problems of the day, and furnished a valuable object lesson for all the world.

Company Meetings.

General Refractories Company, Limited.—The annual meeting was held at Sheffield recently, the chairman, MR. FRANK RUSSELL, presiding. In the course of his remarks, the chairman pointed out that this was the most satisfactory balance-sheet that had ever been placed before the shareholders, and that despite generally unfavourable trading conditions the profit was larger than ever previously in the history of the company, while the sales for the year were no less than £22,000 in advance of those for the previous year. He gave some figures showing the growth in the sales of refractory bricks, commencing with the year 1921. Taking that year's figure as 4, the sales for the succeeding years up to 1924 were 9, 12 and 27 respectively, and during the financial year under review had been no less than 51.

Johnson & Phillips, Limited.—MR. W. C. JOHNSON, presiding at the twenty-first annual meeting, said that the profit for the year, after charging to revenue upwards of £21,000 for maintenance of buildings, plant, etc., amounted to £209,897, as compared with £161,964 for the previous year, an increase of nearly £50,000. The year 1925 was the fiftieth anniversary of the foundation of the firm. It was perhaps only fitting that the jubilee year should have provided record figures That record profit could only have been made upon a record turnover, rendered possible by the greatly increased output capacity of the shops and the efficiency of the selling organisation. The extensions which they had been carrying out during the last two or three years had proved of inestimable value, enabling them not only to increase turnover but to do so in a most efficient and economical manner. The programme of extensions had not yet been completed, but was well advanced. With regard to the question of selling and distributing the further increased output thus anticipated, that important aspect had received proportionate attention.

English Electric Company, Limited.—SIR CHARLES E. ELLIS, who presided at the seventh annual meeting of this company, dealt with the orders secured despite the acute world competition. These were less in value than in the previous year. That was almost entirely due to a sudden falling-off in export orders. Certain foreign Governments which were in the market for the company's products demanded long credits notwithstanding their unsettled economic position and their entirely unconventional economic principles. The board could have obtained sufficient business of that kind to have increased the turnover substantially, but they decided that the risks of such a policy more than outweighed any temporary advantages. They accordingly turned their attention elsewhere. In the latter part of the year the Power and Traction Finance Company, of which one of the directors was chairman, obtained a contract in Greece to the value of over £2,000,000 sterling. Every penny of that amount had been financed, so that as far as the contractors were concerned, the transaction was on a cash basis, and of the total contract a large part represented plant and material to be manufactured in the works of the English Electric Company. There had recently been a welcome improvement in orders secured, and at the present time they had unexecuted orders exceeding in the aggregate the whole output of 1925.

Iron and Steel Institute.

The Annual Meeting of the Iron and Steel Institute, originally fixed for May 6 and 7, but postponed as a result of the general strike, has now been fixed for June 3 and 4 next at the Institution of Civil Engineers, Gt. George Street, Westminster, beginning each day at 10 a.m.

The Annual Dinner of the Institute will be held in the Grand Hall, Connaught Rooms, Great Queen Street, W.C., on Thursday, June 3, at 7 for 7.30 p.m.

MR. J. H. G. MONYPENNY, of Brown Bayley's research laboratory, Sheffield, read a paper before the members of the Royal Microscopical Society on "Micro-structural Features of Modern Rustless Steels."

Correspondence.

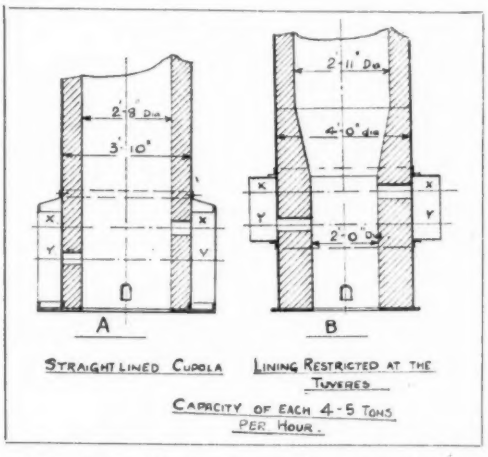
[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

The Cupola Furnace.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—Mr. Hurst, in your issue of April 15, in reply to my contention that with a cupola fitted with a lining restricted in diameter at the tuyeres two rows of tuyeres are better than one row, and that a more even pressure of blast is obtained right across the bed, a more well-defined melting zone and better working conditions with this type than with a straight-lined cupola, says that all cupolas of equal melting capacity have the same internal diameter at the tuyere level.

As this statement makes me wonder if Mr. Hurst is familiar with the type of lining to which I refer, I enclose a drawing showing two linings such as we are discussing, so matters may be quite clear.



In reply to Mr. Hurst's further point that the experimental cupola used for obtaining the melting zone diagram given in his previous article was only 27 in. dia., I should say that this is a large internal diameter for 1,000 cub. ft. of air per minute, and this is reflected in the pressure given at 5.3 oz.; and I consider an internal diameter of 20 in. with 8-oz. pressure of blast would have been better for this capacity of 1 to 2 tons per hour, and that the lesson of the diagram supports the contention, as stated in my previous letter.—Yours, etc.,

E. A. ROPER.

Keighley.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—With reference to the article on "Cupola Furnaces" by Mr J. E. Hurst, published in your issue of THE FOUNDRY TRADE JOURNAL of March 4 and 11, I have read this article with interest, also the criticisms by correspondents subsequent to the publication of the article referred to.

There is one point which is referred to by most of the writers, and that is the question of measuring the volume of air passing into a cupola. Whilst all writers agree that this is of the utmost importance in successfully operating a cupola, the impression one has from the letters published is that—there appear difficulties in the way of obtaining accurate readings. Most foundrymen have used at some time a Pitot tube apparatus for doing this, which has proved unsatisfactory, due to the fact that the conditions generally found in the foundry or at the cupola plant are such that the air is by no means clean, and any fine particles of dust lodge in the Pitot tube, upsetting the reading, and consequently making the observations unreliable.

One writer expressed the opinion that "whilst the volume pressure gauges are a valuable appliance for cupola correction, they are not suitable for being permanently fixed to the cupola for daily use; but the real reason why they are not in more general use is that the cost is more than the average foundry proprietor is prepared to pay."

During the last few years an instrument has been placed on the market by the Crosby Valve & Engineering Company, Limited, London, the construction of which is purely mechanical, and which stands up to the conditions existing on cupola plants, at the same time giving accurate readings. This instrument not only indicates the pressure and volume of air passing per minute, but also records on a chart over 24 hours these results.

The design of this instrument has recently been improved upon, and is now being offered at much lower cost than originally.

There is no doubt that the initial cost of the instrument referred to is small compared with the saving effected in coke consumption, as well as the reduction in waster castings.—Yours, etc.,

For the STANTON IRONWORKS COMPANY, LIMITED,
PERCY H. WILSON,
Foundry General Manager.

Stanton, near Notts.

Refrigeration in Engineering.

BY OUR ENGINEERING CORRESPONDENT.

One of the most remarkable advances in general technology during recent years has been in refrigeration, and the principle is now beginning to be employed regularly in the engineering industries. Everyone is, of course, familiar with the use of low temperatures in connection with ice-cream and the transport and storage of foodstuffs, and incidentally in the year 1924 the total imports of chilled and frozen meat into Great Britain were valued alone at no less than £47,000,000, which included the carcases of 13,000,000 sheep and lambs. In the United States, however, refrigeration is making rapid strides in many other fields, particularly the new household types of refrigerator operated by electric motor, and all kinds of industries such as bread-making and the manufacture of chocolates and sweetmeats. In up-to-date engineering shops it is now also beginning to be the practice to cool articles such as axes, chisels, and saws, which have been subjected to heat treatment, in ice-cold water. This is maintained constant in supply by refrigeration plant, and the results are stated to be much more satisfactory, both as regards quality and throughput. In the same way oil used for quenching purposes is kept at a standard low temperature by means of circulating coils, and here again the quality obtained is much improved, because the oil is always at one definite temperature. One may expect, therefore, that at the present rate of progress ice-cold air will some day be used in the foundry for cooling the castings, especially in such cases as the Ford "continuous" foundry at River Rouge, Detroit.

The technical side of refrigeration plant has also made rapid advances, including improved methods of driving the ammonia and brine pumps, whether by steam engine, Diesel engine, or electricity, and of lagging the refrigerator pipes and chambers. In this latter connection slabs of compressed granulated cork, afterwards subjected to baking, are employed, such as supplied by Messrs. Sutcliffe Bros. and Bryce, Ltd., of Hyde, near Manchester, along with special "zerolite" sectional cork coverings for the pipes, this question having been dealt with at considerable length by Mr. James Hatton, M.I.Mech.E., in a paper at the fourth International Refrigeration Congress.

Finally, it may be mentioned also that the 16th Annual Convention of the American National Association of Practical Refrigeration Engineers, held a few weeks ago at Detroit, is a still further indication of the progress being made by refrigeration in all kinds of unexpected directions.

Birmingham Industries Fair.

The prospectus for the Birmingham Section of the British Industries Fair, which is to be held at Castle Bromwich, from February 21 to March 4, 1927, is now available.

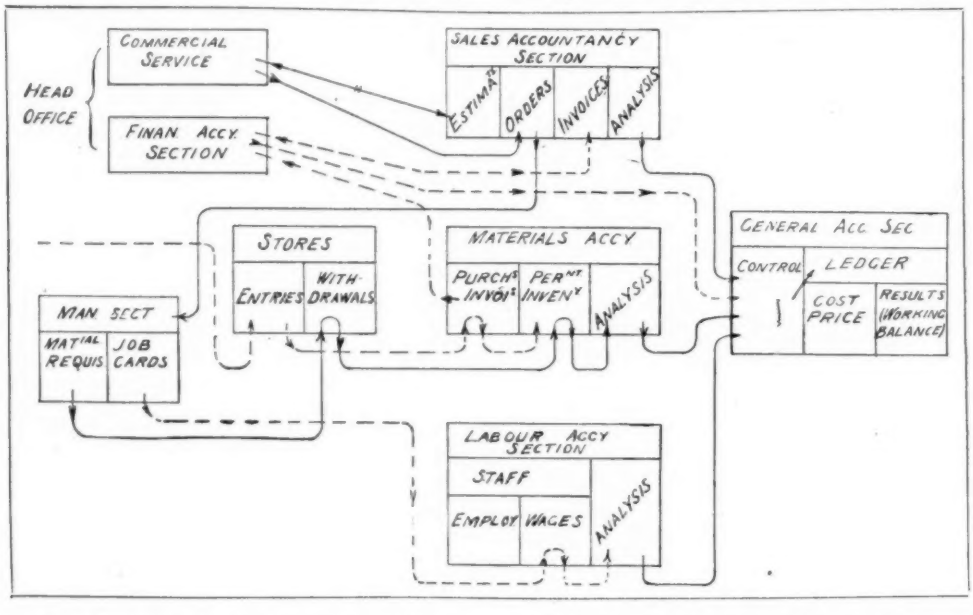
A French Conception of Foundry Costing.*

By René Dureuil, of the Forge and Foundry Works of the Société des Moteurs Gnome and Rhone, Gennevilliers.

(*Continued from page 359.*)

But labour meant wages and wages meant staff. As services ought not to be multiplied (except in the case of a large concern which could subdivide each section and ought to do so far as possible), the labour accountancy section would be cognisant of all questions affecting the staff. In an enterprise of average size, to which this discussion was generally applicable, the chief accountant would therefore be the chief of the staff. He would divide this third section into two offices—a staff office, which would be concerned with all questions of staff engagement, welfare work, workmen's insurance, etc., and would deal with the payment of wages with the aid of the timekeepers, and a second office, which would deal with labour from the point of view of cost price with respect to the analyses and various items of labour common to each section.

Presuming that goods were paid for by a central cash department at the head office, the financial transactions of the works would be very important in this section. It would, therefore, be well to entrust this to the works cashier or the head of the first office of the labour accountancy section, subject, naturally, to the chief accountant. If the works were autonomous or in the case of an owner having only one establishment and the manager himself, the cashiers would obviously be subject to the financial accountancy section, under the control of its chief.



Three essential documents were now available: (*a*) Analysis of expenditure of every kind in goods or materials by orders; (*b*) analysis of labour expenditure, also by orders; and (*c*) analysis of receipts, determined in the same manner.

Thus all the constituents of cost price and of the working balance were available. The last stage of the accountancy would thus have all the requisite elements available and they would have a general survey over the whole business. The term "general" was certainly suitable, and they would now constitute a fourth section, which would be called the general accountancy section.

The General Accountancy Section.

This section had in its hands all the particulars to enable it to determine the cost price. Some of a general nature were, however, lacking, such as rates and taxes, transport charges, head office or company expenses, etc., which the other departments would not require to know, and which it was therefore incumbent upon it to verify and apportion.

These accessory charges, however, were usually of the nature of general expenses, and it was precisely this section which was called upon to determine them, for it must not be forgotten that in their organisation they would have taken care to provide for a certain number of orders concerned with charges incurred under the heading of general expenses, which would be analysed by the preceding sections on the same footing as the charges on the orders to manufacture. Consequently it only remained to enter in an industrial ledger containing the numbers of the different orders the expenditure and receipts relating to them, in order to obtain the cost price and the result.

It should be noted, however, that in the case of a concern with a large number of clients in the habit of ordering small quantities of different castings, this method would result in an imposing number of cost prices, troublesome alike to the person who determined them and the person who consulted them. Whilst he was in favour of the estimating and the detailed costing of individual castings, he did not go so far as to say that this cost price should be determined for every casting. On the contrary, he considered that the orders should be grouped by accounts according to their importance, for accountancy purposes only, even if special accounts had to be opened for important transactions.

If a founder accepted an order from Mr. Z for 2,000 complete continuous heating apparatus, which—to simplify the explanation—they would call the "Brulor" apparatus. He would open manufacturing orders in series of 500 castings, and he would open as many orders as there were castings in the apparatus. For example:—

For Brulor 1st series. Order 6,001, 500 fronts.
For Brulor, 1st series. Order 6,002, 500 doors.
For Brulor, 1st series. Order 6,003, 500 mica frames, etc.

then:—

Order 6,050, 500 fronts for Brulor, 2nd series.
Order 6,051, 500 doors for Brulor, 2nd series.
Order 6,052, 500 mica frames for Brulor, 2nd series, etc.

Per contra, in the industrial accountancy section there would be opened four accounts only:—

500 Brulor apparatus, 1st series.
500 Brulor apparatus, 2nd series, etc.

* Address delivered before the Association Technique de Fonderie at the Ecole Nationale des Arts et Métiers.

By this means there would be obtained, when the order was finished, the cost price for the manufacture of the Brulor apparatus in four stages, and a demand for the price of the doors, for example, would be satisfied by the analyses by orders referred to for the expenditure relating to order 6,002 or 6,051, and would at once be able to give the cost price of these doors. It was necessary, therefore, to group the orders by accounts. For this purpose the general accountancy section would compile a *résumé* of the orders by accounts, which would tally with the analyses and which can be called the "controls," their figures being entered in the ledger.

Case of Small Orders.

The case of small orders could be solved in the same way as that of large orders. To continue the example cited, and supposing that the client made rejections during the enamelling or fitting and ordered certain castings in substitution, for example:—

36 fronts,
23 doors,
150 mica frames.

He would then open a special order for each item, and in the ledger he would have only one account: "Substitute castings for Brulor." It would be for the management to decide at what stage it should be informed. If it were decided, for example, that any transaction exceeding 5,000 francs should be followed individually, the substitution orders would be grouped in sums of that amount, the value of the substitute castings being known, and they would then have the following accounts in the industrial ledger:—

Substitute castings for Brulor, 1st series.
Substitute castings for Brulor, 2nd series, etc.

The same procedure would be followed with regard to small clients when the amount of the account had been fixed as he had stated.

When Mr. X. sent them an order for 5,000 identical pistons weighing 1 kilo. each and sold at 2.50 francs per kilo., they would open an account for:—

5,000 pistons, No. 233, for Mr. X.,

but if he sent them successive orders for:—

10 pistons,
2 cylinders,
3 jackets,
1 gear box,

they would open an account for "Miscellaneous castings, 1st series, Mr. X." The first series would be closed when its total amount reached 5,000 francs. They would then open another series:—"Miscellaneous castings, 2nd series, Mr. X."

The industrial accountancy service would keep up to date a list of the accounts open in the ledger, which list would correspond with the manufacturing cost price *automatically determined*. It would enter opposite each account the numbers of the manufacturing orders comprised in these accounts. Returning once more to the general accountancy section, especially the industrial ledger, two observations were necessary. First of all, the word ledger implied debit and credit. Moreover, a ledger meant the periodical registration of accountancy operations. The first observation led them to examine each of their accounts. The organisation described demands a *debit*, representing the expenditure entered under each account, and a *credit*, representing the invoices sent out against each account. de Boisgrollier had said that "statements" need not be compiled by double entry showing debit and credit. It should be remembered, however, that cost price was an accountancy document which should be drawn up according to accountancy data; that was to say exact data. But the object of industrial accountancy was not merely to give the cost price of manufacturing the goods, it had also to compare it with the selling price and draw up a statistical statement of the result.

It seemed useless to do the same work twice in a different form. It was preferable to arrive immediately at the cost price and the automatic result shown by the ledger. This cost price, moreover, could be, and ought to be, as clear as possible in order to derive from it all the principal particulars. It was precisely by this means, while at the same time doing justice to the second observation as to periodical registration, that he was able to agree with the opinion of Androvin that *the cost price ought to be continuous.*

The method of the industrial ledger made up each month would enable them not merely to know how their manufacturing departments were working during each period, but also to know how their financial affairs were going, showing monthly the difference between their receipts, or invoices, and their expenditure, or periodical cost price; and this in respect to each transaction or each client, according to the subdivision they had introduced into their accounts. The duties and functions of their fourth section were therefore determined as follow:—(*a*) Control of expenditure, (*b*) industrial ledger, (*c*) automatic cost price, (*d*) periodical and *automatic* working balance, and (*e*) detailed cost price on demand.

The analysis of expenditure should be effected with such care that the factors, materials, labour and general expenses became the following:—

Raw or direct materials, that was those which were directly applied to the article manufactured and which formed its volume, no matter how these materials were inter-connected and transformed in order finally to become the finished products;

Direct labour, that was to say, the labour of the producing workmen working directly in fashioning the work, exclusive of all accessory labour contributing indirectly to its production.

Before passing to the third item, "general expenditure," he must apologise for having used the term "production workmen." His audience were all, or nearly all, foundrymen, works managers, or foremen. Yet if they did not, day after day, ram sand into the moulds or work the furnaces they were supposed to be "non-production." If one day they were not at the head of their firm, their department or their shop, if they were unable from some unavoidable cause to provide for the management and supervision of their staff for one day, they all knew that production diminished. They were not, therefore, non-producers. The expense incurred in remunerating their labour or recompensing their efforts was a charge entered indirectly against the products manufactured.

They had, therefore, two categories of workmen, and by workman he meant the man who "worked"—the "production" worker and the "auxiliary" worker.

Returning to the *general expenses* account, it had been stated that the cost price must be freed from three other constituents of the selling price:—(1) The group of transport charges; (2) the group of commercial charges, and (3) the remuneration of capital employed, which, on the whole, constituted the profit.

He considered, however, that the cost price was divisible into three stages:—(1) The manufacturing cost price, which was the cost pure and simple of the castings as they came from the workshop; (2) the works cost price, which comprised, in addition, all common administrative charges of the works, despatch charges, exclusive of long-distance transport; and (3) the exploitation cost price, which comprised all charges involved in operating the enterprise, including transport, Customs and commercial charges.

The difference between this and the selling price gave the profit. Thus every expense of any kind whatsoever was an element in the cost price, and it was impossible to speak of complete net cost while there were still charges to be met over and above it. He had thus indicated the analysis of his general expenditure, namely:—(*a*) General workshop or industrial charges carefully differentiated, not forgetting the proportion applicable to the materials directly worked; (*b*) general administrative charges; and (*c*) general commercial charges, including transport and Customs charges, if any.

Application to the Foundry.

In the iron foundry the raw material was represented by a single product—pig-iron of different qualities. The various auxiliary charging materials necessarily constituted a part of the direct material. In foundry work, however, the direct material was not merely the raw material worked. It necessarily included the costs of transforming this raw material, while these costs comprised all

the work done by the staff employed at the cupola.

Here two controversial questions arose:—Were they to stop at the moment when the melt issued in liquid form from the cupola or were they to continue until it fell into the mould? The Belgian Association, in the conclusions, seemed to hold that these expenses stopped short at the moment when the ladle was filled with molten metal. He preferred, however, to hold that the cost of conveying the liquid metal to the mould entered into the transformation costs. There was no reason to devote a special section to these handling costs, which would be very difficult to define and to charge to the different orders.

It was not desirable for the moulders themselves to fetch their molten metal from the cupola. It should be done by labourers. In the event of a spoiled casting the moulder would not fail to plead that "the metal was too cold," or perhaps the reverse. The moulder would always find a good reason to prove that he was not responsible for the catastrophe. It would also be advantageous to any foundry of a fair size to appoint a competent foreman to supervise the teeming, who would obtain particulars from each man before casting, and cast accordingly. The time occupied in pouring in quantity production foundries was sometimes very important in relation to that occupied in actual moulding, owing to the enhanced speed of production and the increase in the number of moulds, and where a casting gang was essential.

The second controversial question was whether there be included in the price of the direct material all the expenses necessitated by the maintenance of the cupola, the ladles and casting material as well as the cost of motive power and upkeep of the fan? The Belgian Association took this view, which he shared; but it did not define precisely in what manner these expenses should be incorporated. Actually they were general expenses. Thus the question of "raw materials" in foundry work was totally different from what it was in engineering or forging work. In engineering work the starting point was a definite, thoroughly familiar product which was to be manufactured. The price of the material was simply a cost price, the purchase price, plus, of course, the costs of transport and storage. In foundry work the starting point was a series of initial products which had to be transformed in order to obtain the direct-material cost. Hence it was necessary to record this operation and to establish from it the cost price. The term "cost price" involved the three components—materials, labour and general expenses. It is thus logical to separate the transformation costs into two elements, and that the price of the direct material would be a complete cost price which would comprise three elements:—(*a*) Materials properly so-called; (*b*) labour, cupola and casters; (*c*) general expenses on materials—materials for upkeep and power, labour for maintenance.

Between the liquid metal and the direct labour another factor was interposed in foundry work, *viz.*, moulding and core sand. These had never been adequately discussed, nor had the place they might occupy in the cost price been defined. He had had occasion to prove in certain cases that the price of the sands employed in relation to a kilo of metal might reach a comparatively very high figure, if by "sands" there was understood the total cost price of these sands, *i.e.*, moulding and core sand, accessories and cost of dressing. He believed, to give a concrete example, that the figure would be found to be as much as 8 per cent. of the cost price, tending to an average of fr. 13 per 100 kg. of good castings delivered.

Apart from the effect of the preparing of the sand on the quality of the products, an effect which was very important, the economy of its preparation had, therefore, a very great influence on the cost price. Certain founders regarded the sand as an element of general expenditure. Others included this amount in the direct material, in accordance with a method of distribution. The former method ought to be rejected. The amount of sand used varied so greatly that it could not be included under the heading of general expenses. It appeared that the item sand should be apportioned as accurately as possible to the orders which had necessitated its use. It seemed preferable, therefore, to include it in the direct material.

Certain founders, having obtained the cost price of their sand, referred it to the cost per kg. of good castings obtained—the whole during a period corresponding to the frequency of making up the accounts. This proposition was not accurate. The amount of sand could not be a precise and direct function of the weight of the casting obtained. In certain cases it would even be the contrary. Nor did it appear to be desirable from the dimensions of the box. He was not convinced that it could be compared with the direct labour, unless there were an analysis of the time occupied in its elementary operations determining precisely the time taken in ramming the sand. And, moreover, in that case, the ramming time was as much a function of the form of the casting and the number of points as the amount of sand used.

There remained only one method—the exact method—of estimating the sand actually used. To whom should this estimate be entrusted if not to the moulder himself? The method was by the daily allocation to each floor of a specified and known volume of sand and by providing the job card with a special column in which the moulder would show the volume of sand used opposite the distribution of his time for each order. It was a measure which it was obviously desirable to try to get adopted, and it was obviously one which, like every innovation, would meet with marked hostility. But there was no reason why very satisfactory results should not be obtained in a very short time.

This system applied equally to core sand. At this juncture the cost price of prepared sands would be determined per cubic metre, and their exact application to the cost price would no longer be difficult, the accountancy section being in possession of all the elements for doing so.

Nor did the question of general expenses present any special characteristic. What had been said as to the necessity of their detailed differentiation was even more applicable in the foundry than elsewhere, owing to the fact that certain charges which at first sight seemed general expenses, and which went under that heading in most other industries, were in foundry work direct charges.

Non-Ferrous Foundries.

The application of accountancy to non-ferrous metal foundries, such as bronze and aluminium, was similar to its application to iron. There was, however, one peculiarity. The alloys cast each day were generally very different, and it appeared difficult to determine with sufficient precision the charges really applicable to each alloy. It was well, therefore, to separate clearly the accounts of raw materials proper from the cost of transformation account. Several raw material accounts would be opened corresponding to the different alloys, comprising the value of the metals and accessories—in fact, everything that went into the crucible. The transformation charges would be entered for the aggregate tonnage transformed, account being taken of the respective densities, and apportioned to each order according to the weight used.

The transport of the metal to the actual mould should be entered in the transformation charges, the more so as, in the foundries under consideration, there was a head caster responsible for the temperature taken by him on the pyrometer at the moment when the casting was poured. The question of sand had as important a place as in the iron foundry. Per kilo. of metal melted, the value of the sand was much higher than in iron moulding. Moreover, as the moulds were generally stoved, it was logically desirable to distribute the stoving charges in proportion to the volume of dried sand, subject to corrections being made in the case of very large boxes. The questions of labour and general expenses were of the same nature as in the iron foundry. In determining the general expenses, however, account must be taken of the respective densities of the metals whenever the application of an aggregate figure had to be a function of the weight.

Desulphurisation Experiments on Cast Iron.

Th. Meierling and Dr. W. Dennecke, in a recent issue of "Giesserei Zeitung," describe experiments with cast iron with respect to (1) the degree of desulphurisation in strongly superheated iron baths high in sulphur content, without the addition of a flux; (2) in just liquid iron (high in S); (3) composition of the segregated product; (4) degree of desulphurisation in cast iron of normal composition; and (5) influence of movement of liquid iron upon desulphurisation.

The reaction of slag upon the iron bath should be avoided as far as possible, therefore the iron was handled in hand shanks, which could easily be slagged.

Experiment 1: *Hot Liquid Iron, High in Sulphur.*—The first sample was taken at the spout, whilst the second sample was procured from the filled 500 kg. ladle near the cupola. The ladle was then transferred to the casting pit—a distance of 75 metres from the cupola—passing via two turntables. The iron destined for the samples was then poured out into a hand shank, from which the third sample was taken out. Then the iron was poured into another dried ladle from a considerable height to favour the solidification of the sulphur combinations by the cooling air current; then the fourth sample was taken. The iron was

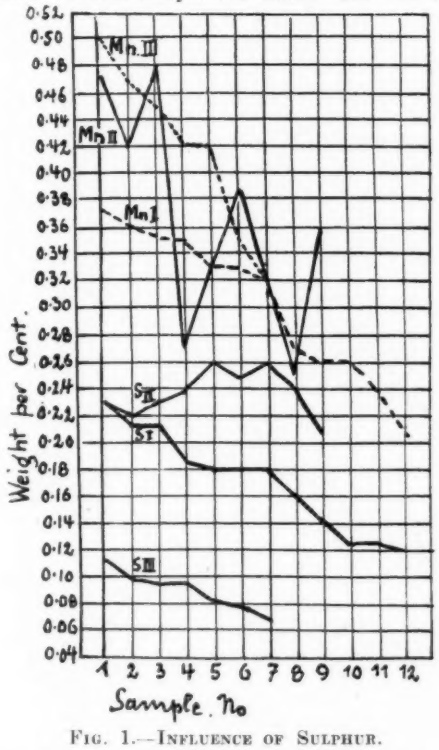


FIG. 1.—INFLUENCE OF SULPHUR.

then decanted from one ladle into the other until it became semi-fluid; after every decantation a sample was taken, the total number of samples being 12. During the experiment a strong smell of sulphur dioxide was perceived; after the fourth and the last decantation there formed a segregation on the surface of the bath, which was removed by the skimmer. The composition of the samples is given in Table I and in Fig. 1 (curves S_1 and Mn_1); the sulphur content has decreased at about 50 per cent., the Mn content at about 43 per cent.; the Si content remained the same. The composition of the segregated product was:—Si, 3.7; Mn, 3.0; P, 0.58; S, 1.2; total C, 3.1 per cent. CaO,MgO and Al_2O_3 were not found, that is to say, that no slag was present.

The desulphurisation by segregation chiefly depends on the formation of the highly freezing point (1,620 deg. C.), light MnS (spec. grav. 3.6 to 4.0), respectively on the formation of mixed crystals rich in MnS (MnS + FeS); the light FeS (spec. grav. 4.84) freezing out at 1,207 deg. C. is retained by the solidifying iron bath.

Experiment 2: *Iron of the same Composition as in Experiment* 1, was only just liquid at the start. The samples (9 only) were taken in the same manner as above. The smell of sulphurous acid was not perceived. The segregation of sulphur did not materialise as distinctly as in Experiment 1. The composition of the samples is given in Fig. 1 at curves S_2 and Mn_2, which indicates that there is no desulphurisation in sluggish iron.

Experiment 3: *Cast Iron of Normal Composition.*—The samples were taken as previously and the results are shown in Fig. 1 by S_3 and Mn_3. The curves show that an essential lowering of the sulphur content did not occur during the transport of the ladle. This fact might come from

TABLE I.—*Composition of Samples Taken at Various Stages.*

Sample No.	S.	Mn.	Si.
	Per cent.	Per cent.	Per cent.
1	0.236	0.37	2.1
2	0.216	0.36	2.16
3	0.210	0.35	2.2
4	0.185	0.35	not det.
5	0.182	0.33	,,
6	0.182	0.33	,,
7	0.178	0.32	,,
8	0.164	0.27	2.15
9	0.144	0.26	2.12
10	0.128	0.26	2.16
11	0.126	0.24	2.14
12	0.122	0.21	2.16

the short distance of the casting pit from the cupola, that is the cooling of the molten iron had not yet advanced so far as to favour the solidification and segregation of MnS and FeS. On the other hand, the frequent decantation of the iron might be the real cause of the desulphurisation. To decide this point the fourth experiment was undertaken.

Experiment 4: *Iron High in Sulphur.*—The first sample was taken at the spout, the second sample from out the ladle near the cupola. Near the casting pit the iron was transferred to three shanks ladles and a sample taken from each of them. The first ladle was put aside; the second ladle was cast upon the floor, and the third one teemed repeatedly. Samples were taken when the iron had become semi-fluid. The composition of the samples is recorded in Table II.

TABLE II.—*Samples of Pasty Iron Under Varying Conditions.*

Sample.	S.	Mn.
	Per cent.	Per cent.
At the spout	0.205	0.4
From the ladle near cupola	0.2	—
,, ,, ,, casting pit	0.205 to 0.201	0.4 to 0.38
,, ,, put aside ..	0.162	0.33
,, ,, cast on the floor	0.160	0.30
,, ,, repeatedly cast	0.150	0.35

The results show that the movement of the molten metal had no influence on the desulphurisation.

Standard Pattern Colours.

The American Foundrymen's Association is issuing a colour chart showing the standard colour markings for wood patterns and core boxes which have been adopted by the Association on the recommendation of the Joint Committee on Pattern Equipment Standardisation. The chart, which shows in colours examples of the colour markings, formulates the following standards:—

(1) Surfaces to be left *unfinished* are to be painted *black*.

(2) Surfaces to be *machined* are to be painted *red*.

(3) *Seats of and for loose pieces* are to be indicated by painting *red stripes on a yellow background*.

(4) *Core prints* and *seats for loose core prints* are to be painted *yellow*.

(5) *Stop-offs* are to be indicated by painting *diagonal black stripes on a yellow background*.

XUM

Foundry Management, Organisation and Costing.—(I).

By M. E. NICHOLLS.

The underlying principle of works management is ability to control, but the means whereby the principle is put into practical operation vary. There are, in the broad sense, two classes of people in industry—those who can control, and those who must be controlled. But in connection with the former a further sub-division is necessary, for there are those who can manage only when the path is clearly defined by a higher authority, and there are those capable of making a path for themselves.

The latter are, of course, at the top of the tree, the supreme managers of industrial undertakings, and the controllers of those whose ability to manage is restricted to a definite phase of the organisation. It is probably the case, however, that amongst the last-named there is a number of potential supreme managers, who are, as yet, too young to have gained the experience necessary for unrestricted control, and are gaining that experience by service on the lower rungs of the ladder. There may also be others who, while possessing the necessary qualifications, are debarred from unfettered control by force of circumstances, and in this category may be placed the head of a foundry which forms part of a general engineering organisation.

This man may be a competent foundry manager, but because that which he controls only forms part of a whole, he must perforce submit to a higher authority. In an independent foundry he would be free to follow his own bent (subject, of course, to the limitations imposed by the policy of the directors), but as it is he is influenced by the views of his superior. He can suggest, but he cannot act without permission, and more often than not he is regarded as a foreman rather than as a manager.

To such a man the characteristics of the works manager are of the utmost importance, for whereas in one works the latter is of the non-interfering type, in another the characteristics of the works manager are just the reverse. However, a man cannot control unless he can trust those under his control, and interference is assuredly not trust.

Let there be no mistake about the meaning of interference, for it is not to be assumed that the manager is to allow his subordinates to go their own way, without let or hindrance. Such a policy, instead of indicating managerial ability, would mean managerial ineptitude. Even though the works manager is not a foundryman, it is not to say that he must scrupulously refrain from interesting himself in the foundry, but he can do this without being interfering. He can control the foundry (as a unit of the works organisation) without ostentation, and the head of the foundry can manage his department without the fact being too blatantly apparent that he in turn is being managed.

Knowledge of control is always irksome, and particularly so when lack of practical knowledge is imputed to the controlling head. The average works manager has little practical knowledge of foundry work, and must needs rely upon the foundry head to no small extent. It is this state of affairs that brings the question of interference to the fore, and often the suggestion that, in matters concerning foundry work, the foundryman shall have the last word. But because the works manager lacks practical knowledge of foundry work, it does not follow that he is incapable of managing a foundry, for the real managerial class is a class apart, and can manage anything from a chocolate manufactory to an engineering shop.

With one proviso—that skilled practical assistance is available, and this is never a difficult matter, provided that the skilled practical assistance can be trusted. It is for the manager to see to this, and, if he *is* a manager, this again presents no difficulty. If the head of the foundry is a practical foundryman, the works manager can formulate his policy and know that it will be carried into effect, because he can *trust* the man to whom the "carrying out" has been deputed, and because he can trust, he has no reason to interfere—he knows that the thing will be done, and how it is done does not concern him.

It is not established that it is desirable for every engineering works manager to be a practical foundryman, as so many people insist, for it is improbable that any real benefit would accrue. The amount of practical foundry experience gained during an engineering apprenticeship would be infinitesimal, and would probably, in after years, be productive of actual harm. "A little knowledge is a dangerous thing," and foundry work is so intricate and so different from general engineering that it would be distinctly unwise to attempt to merge the practical side of both into the mind of one individual.

Fortunately for all concerned, although there is a managerial class, the units are not all of one type, consequently the application of the principles vary. As a general rule circumstances determine the type, for it is a truism that "the need produces the man," although at times mistakes do occur. It is also the case that there are many so-called "managers" who are not managers at all—who have been pitch-forked into positions they have no right to hold by influence. These are the people who cause trouble, and stir up strife, and yet, in quite a number of cases, the works over which they pretend to exercise control are quite prosperous concerns. It may be that they possess certain unseen qualifications which nevertheless are to some extent effective, or it may be that the foundation of the business is so sound that not even mismanagement can shake it, but that they do *not* belong to the real managerial class is proved by the strife, discontent, and confusion which exists in the works over which they hold sway.

In one works the "live wire" is in evidence. He is here, there and everywhere; knows what he wants, and never happy until he gets it; but it is at once apparent that he *is* a manager, and that a "live wire" is necessary to that works.

In another the manager is rarely to be seen; he sits in his office and plans, but the fact that the organisation runs on oiled wheels demonstrates that, if the manager is not visible, management is, and that, for the factory in question, the managerial policy pays.

Between these two extremes there are many types, but each is undeniably a type of real management, admirably suited to the needs of the specific factory. Whether the factory is large or small, complex or simple, concerned with varied lines of manufacture or given over entirely to one, the principles of management are precisely the same, but the methods of management must of necessity vary in accordance with the needs of the specific factory.

From now on these articles are concerned wholly with the foundry, either as a unit of a large engineering works organisation or as an independent concern. The fact that a very large number of foundries in this country are attached to engineering works has made it necessary to take this aspect into consideration when dealing with the principles of management, for undoubtedly the foundryman in these circumstances labours under some disadvantages, although these can be considerably minimised by wise and efficient management. If the works manager efficiently controls the works as a whole, and the foundry manager efficiently controls that phase of the organisation assigned to him, the two will work in harmony and complete accord, each pulling his weight in the right direction, ensuring prosperity to the undertaking as a whole, and to the various units comprising that undertaking.

(*To be continued.*)

ONLY LIMITED SUCCESS attended the efforts of the T.U.C. to involve the members of the engineering and shipbuilding unions in the strike, the men apparently objecting to the issue of the order before a ballot had been taken. So far as the shipyard men were concerned only a very small percentage, principally fitters, obeyed the call, and at many yards there was no response at all. At the engineering establishments the number of men who came out was certainly larger but was by no means unanimous.

COMPLETE
Foundry Equipment.
Telegrams: "LADLES" MANCHESTER
Telephone: "No 2297 CENTRAL" MANCHESTER.
FILLET
"TAPIX"
CORE GUM
TERRA FLAKE
JAMES EVANS & Co. BRITANNIA WORKS,
BLACKFRIARS, MANCHESTER.

Trade Talk.

Cragg & Company have removed from Leazes Park Road to Dunn Street, Newcastle-on-Tyne.

W. H. Arnoit, Young & Company, 55, West Regent Street, Glasgow, C.2, have removed their Glasgow offices to new premises at Fullarton Iron Yard, Tollcross, Glasgow.

The imports of foreign iron ore at the Senhouse Dock at Maryport during April amounted to 10,600 tons, against 14,300 tons for March and 4,000 tons at the corresponding period of last year.

The English Electric Company Limited, have an order from the Aberdeen Corporation Electricity Committee for a 10,000 k.w. turbo-alternator, with condensing plant, at the contract price of £38,000.

The Metropolitan Vickers Electrical Company, Limited, Trafford Park, Manchester, have an order for the electrification of 73 kilometres of line for the Estrada de Ferro Oeste de Minas for the Republic of Brazil.

H.M. Medical Inspector of Factories (Dr. John C. Bridge) states that a soaking in a 5 per cent. Lysol solution for half an hour and subsequent washing in water is a suitable method for the disinfection of sand-blast helmets.

New Alldays & Onions, Limited, have recently extended their plant for the manufacture of the "Thwaites" type cupola and charging machine, etc. Mr. W. J. Hervey, who represented the latter firm, has now joined the staff of New Alldays & Onions, Limited.

Leyland Motors, Limited, have an order from the New South Wales Government Railways for twenty 4-tonners, which will be employed in the work of carrying wool from the railhead at Darling Harbour to the Wool Stores. Previously this work has been accomplished by horse transport.

The Foundry Trades Equipment and Supplies Association held a council meeting last week for the purpose of deciding whether or not it was desirable to postpone the International Foundry Trades Exhibition which is due to be held at the Agricultural Hall from June 10 to 19. It was decided that the exhibition should be held on the date already fixed.

Sir Robert Hadfield, of Hadfields, Limited, announced at Sheffield, on April 30, the manufacture of a new alloy steel capable of withstanding abnormally high temperatures. The steel, he said, would no doubt help to solve many industrial problems in the application of high-temperature gases, and in course of time would revolutionise mechanical propulsion.

Richardson, Westgarth & Company, Limited, have just secured orders for a 15,000 k.w. set of turbo-alternator and condensing plant and two other independent sets and condensing plants, all for London power stations. It was stated at the annual meeting of the company that they had formed the Marine Oil Engine Development Syndicate, Limited, for propaganda work in connection with the Diesel engine.

Cowiesons, Limited, St. Rollox, Glasgow, have now received orders from the Second Scottish National Housing Company (Housing Trust), Limited, for 500 of their super-steel three-roomed bungalows and cottage type double-storey dwellings, of which 200 are to be erected in Glasgow, 100 at Greenock, 50 at Hamilton, 50 at Tarbothie, 50 at Dundee, and 50 at Edinburgh. The whole contract will exceed £200,000, and the work has to be completed by the end of December.

Cox & Danks, Limited, have raised another vessel of the German Fleet which was scuttled at Scapa Flow seven years ago. This is the G. 104, a destroyer of approximately 1,300 tons. The G. 104 is the twenty-fifth vessel to be brought to the surface by means of floating docks, and is the last destroyer which the company have to salve. Cox & Danks, Limited, are now concentrating the whole of their efforts on the battle-cruiser "Hindenburg," after which attention will be given to the battle-cruiser "Seydtlitz" and the light cruiser "Bremse."

The shipment of pig-iron from the Port of Middlesbrough during April amounted to 26,985 tons, as compared with 35,955 tons in March, a decrease of 8,970 tons. The shipments to Italy were higher than in March, being 5,250 tons, against 4,045 tons. On the other hand, nothing went to the U.S.A., as compared with 6,130 tons. The coastwise shipments were down from 15,949 tons to 13,451 tons, and the foreign shipments from 20,006 tons to 13,534 tons. The shipments of manufactured iron and steel amounted to 62,051 tons, as against 77,258 tons, a decrease of 15,207 tons. Only 12,155 tons went to India and Ceylon, as against 18,482 tons, and the shipments to South America were 9,180 tons, as compared with 10,006 tons in March. The aggregate shipments of pig-iron and manufactured iron and steel during April amounted to 89,036 tons, as compared with 113,213 tons in March, a decrease of 24,177 tons.

Personal.

Mr. A. Spittle has been elected chairman of the Birmingham section of the Institute of Metals.

Mr. T. J. Kennedy, managing director of B. Mason & Sons, Limited, has been re-elected president of the Birmingham Business Club.

Mr. V. C. Faulkner, editor of the Foundry Trade Journal, has been elected chairman of the Foundry Trade Supplies and Equipment Association, Limited.

Mr. D. H. Wood has been re-elected chairman of Birmingham, Coventry and West Midlands Branch of the Institute of British Foundrymen, and Mr. F. K. Neath replaces Mr. H. Roe as hon. secretary.

Mr. W. Jolley, foundry manager to the Metropolitan Vickers Company, Limited, has succeeded Mr. R. O. Stubbs as president of the Junior Section (Lancashire) of the Institute of British Foundrymen.

Mr. E. D. Simon, of Henry Simon, Limited, and Simon Carves, Limited, has acquired Wythenshawe Hall, together with 250 acres of park land surrounding it, and presented it to the City of Manchester for the benefit of the townspeople.

Mr. R. H. McMaster has been elected president of the Steel Company of Canada in succession to the late Mr. R. Hobson. Mr. H. Champ, secretary-treasurer, becomes a vice-president, and Mr. H. M. Jacques has been added to the board.

Sir John E. Thornycroft, chairman of John I. Thornycroft & Company, Limited, has been elected to a seat on the board of the Iron Trades' Employers' Insurance Association, Limited, in the place of Sir John Dewrance, who has resigned on account of ill-health.

Wills.

Ward, T. W., of Sheffield, shipbreaker...	£485,000
Swale, J., of Moston, Manchester, iron-founder	£10,272
Baker, J. E., chairman of Davy Brothers, Limited	£8,295
Whittaker, H., Blackwells Metallurgical Works, Liverpool	£7,386
Lewin, W., of Cromwell Street, Nottingham, ironfounder	£23,878
Crofts, G., until recently chairman of Crofts & Assinder, Limited, brass-founders	£15,114
Harris, R., of Lyncombe Lodge, Sandford, Somerset, formerly of Whitchurch, near Bristol, metal merchant	£6,092
Carter, F., of Pendleton, Lancs, late of J. Carter, Sons & Company, Limited, engineers	£8,833

Contracts Open.

Batavia, June 21.—Cast-iron socket pipes, sluice valves, underground cocks, specials drawn iron piping, pig lead, etc., for the Director of Municipal Works at Batavia. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 3092.)

Birmingham, June 10.—62 in. diameter socket and spigot steel pipes lined centrifugally with concrete, and etc., for the Birmingham Water Committee. The Secretary of the Water Department, Council House, Edmund Street, Birmingham. (Fee, £1 1s. for each contract, returnable.)

Cairo, July 1.—Supplying and laying cast-iron pipes from Ameria to Kair el Gamous, etc. The office of the Egyptian Government's Agent, 41, Tothill Street, Westminster, London, S.W.1, and the Egyptian Embassy, London.

Esquimalt, B.C., June 2.—Supply and erection of one 5-25-ton electrically-operated portal crane, for the Department of Public Works of Canada. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 3110.)

London, S.W., August 5.—Percussion drilling tools, sand pumps, tanks, etc., for the Union Tender Board. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 3101.)

Nottingham, June 8. — 420 tons of steelwork in stanchions, girders, beams, roof trusses, etc., and two tons of cast-iron in gutters, standards, etc., for the Corporation. Mr. T. W. Gordon, city engineer and surveyor, Guildhall, Nottingham. (Fee, £2, returnable.)

Pontefract, May 31.—Two 20-ft. square luteless cast-iron purifiers with the necessary lifting gear and valves, for the Corporation. Mr. B. Hudson, engineer and manager, Gasworks, Pontefract.

The Derby Town Council propose placing a further contract with Newton, Chambers & Company, Limited, of the Thorncliffe Ironworks, near Sheffield, for the erection of 250 cast-iron houses on the Osmaston estate and at Allenton, at £415 per house, a reduction of £10 on previous prices.

Sterling

LIGHTNESS and ease of handling, Robust Construction, Accuracy and Durability are the paramount essentials of the modern Moulding Box.

These qualities are solidly built into all Sterling Boxes. There are twenty different standard styles of Sterling Boxes. Each style has been minutely studied in every detail and has been designed to fulfil a specific foundry service with final economy.

As it is never too soon to introduce an economy write to us to-day and ask our representative to call upon you and discuss the Sterling Box from the point of view of *your* Foundry.

STERLING FOUNDRY SPECIALTIES LTD. BEDFORD.
LONDON OFFICE, 13, VICTORIA STREET, S.W.1.

GANISTER, CUPOLA BLOCKS, FIRE BRICKS, FIRE CLAY.

Silica Bricks, Tuyeres, Stoppers, Nozzles, &c.

STEEL MOULDERS' COMPOSITION, SILICA CEMENT.

J. GRAYSON LOWOOD & Co., Ltd.

DEEPCAR, nr. SHEFFIELD.

Telegrams: "LOWOOD, DEEPCAR."

SIEMENS' STEEL PROCESS

BOILER, SHIP and BRIDGE PLATES, etc. ANGLES and all forms of Sectional Bars. TYRES and AXLES to all requirements. CASTINGS of all kinds and of Largest Sizes. FORGINGS of every description. BILLETS, BLOOMS, RAILS.

SPECIAL STEEL FOR CONSTRUCTIVE PURPOSES.

The STEEL COMPANY OF SCOTLAND, Ltd.

Head Office: 23, ROYAL EXCHANGE SQUARE, GLASGOW.
Works: HALLSIDE, NEWTON and BLOCHAIRN, GLASGOW.

CONTRACTORS TO HOME, COLONIAL AND FOREIGN GOVERNMENTS.

Established 1872. ***Telegraphic Address: "Steel, Glasgow."***

IRON AND STEEL MARKETS.

Pig-Iron.

MIDDLESBROUGH.—Conditions in the Cleveland iron trade are, for the time being, without hope of improvement, and, although markets have been opened as usual, the volume of business transacted has dwindled almost to the vanishing point. As a matter of fact, there are no buyers to buy and no sellers willing to sell. Consequently, there is at present no possibility of naming any really reliable quotations. In one or two instances makers have been pressed for small quantities of iron, and have secured a price equal to 72s. 6d. per ton for No. 3, but these minor transactions cannot reflect an actual market position. On this basis No. 1 would be 75s., No. 3 G.M.B. 72s. 6d., No. 4 foundry 71s. 6d., and No. 4 forge 71s. per ton.

The hematite makers are in exactly the same position as the foundry ironmasters, except that the stocks of hematite on the ground are larger. For East Coast mixed numbers 77s. 6d. per ton is the figure named, but business is practically held up until the steelworks can resume. On the North-West Coast quotations remain nominally at their old level, with Bessemer mixed numbers £4 2s. 6d., c.i.f. Welsh ports, £4 5s. to £4 7s. 6d. at Glasgow, £4 8s. to £4 10s. at Sheffield, and £4 11s. to £4 13s. 6d. at Birmingham.

LANCASHIRE.—With the Whitsun holidays dominating interest during the current week business in the local markets for foundry pig is necessarily at a standstill, and little activity can be expected until the future of fuel supplies is more clearly defined. Last week the Derbyshire iron makers on the Manchester market reported an advance of 2s. 6d. per ton, making No. 3 foundry pig 77s. 6d., delivered Manchester, thus following the lead of the Middlesbrough furnaces in the case of Cleveland iron. It is not an easy matter to get at the basis of other brands just now, for many makers decline to quote, but there is no doubt that ideas as to current values have hardened appreciably.

SCOTLAND.—The closing down of the collieries has had a corresponding effect upon the blast furnaces in this area, and the pig-iron markets are idle. Meanwhile the founders are mostly still working, and the pig-iron makers have been consequently able to resume deliveries against old orders. In spite of the diminution in the make, Scotch prices are not any firmer, and No. 3 foundry is still obtainable at 76s. at the furnaces. New business is limited, however, as buyers are not able to renew their fuel supplies, and consequently only see a short distance ahead.

Finished Iron.

One or two of the finished iron mills have been able to maintain operations, but not the forges, of course, and those works which have been entirely off have not been able to make a restart as yet; nor will they, at best, for some time, until steady and ample supplies of fuel are forthcoming. In consequence, most of the very limited demand for finished iron is still being supplied by stock-holding merchants. Inquiries are beginning to be put out in anticipation of the resumption, and makers are firm, but it does not seem probable that much will be done until the Whitsuntide holiday is over.

Metals.

Copper.—The most remarkable feature of the very eventful period just concluded has been, unquestionably, the complete freedom from panic incidents in the various markets for base metals, which, throughout, have remained steady, with a fair daily turnover during the past three weeks. Naturally, prices have had a declining tendency, as although the business has been quite good in the circumstances, it could not have been so bulky as even in the depressed period prior to the strike. Many consumers, whose supplies of copper are adequate, have not been buying, but others have been dealing fairly freely, and combined with business of a speculative character this has given the market quite a cheerful tone. The price of standard cash copper at £56 17s. 6d. was 5s. down since the close of last month, quite a moderate decline in face of what might have been expected. Last week the market was only poorly supported, and values have declined further. Current quotations :—*Cash* : Thursday, £56 5s. ; Friday, £56 5s. ; Tuesday, £56 5s. ; Wednesday, £56 5s.

Three Months : Thursday, £57 2s. 6d. ; Friday, £57 2s. 6d. ; Tuesday, £57 2s. 6d. ; Wednesday, £57 2s. 6d.

Tin.—Influenced probably by the somewhat disappointing statistical returns for last month, the position in the tin market has developed a distinctly weaker tendency, quotations retreating on Friday 10s. per ton, thus reaching the lowest level recorded this year at £266 17s. 6d. The previous time the metal was quoted at this figure was on September 30 last, when the price was on the up-grade after the big decline to £250 5-16 in August. There have, at the same time, been numerous transactions of a speculative character, particularly in future metal, and this has maintained the market in a state of moderate activity. Prior to the strike business in the tinplate industry was quite dead, and it was not long after the declaration of "war" that the tinplate mills had to cease operations. Current quotations :—*Cash* : Thursday, £267 5s. ; Friday, £266 15s. ; Tuesday, £268 15s. ; Wednesday, £268.

Three Months : Thursday, £265 ; Friday, £265 5s. ; Tuesday, £268 5s. ; Wednesday, £268.

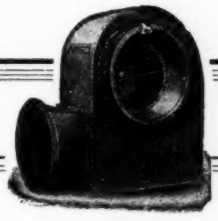
Spelter.—Most of the works producing this metal having been enabled to continue operations, supplies have been readily obtainable, and with the galvanising industry well maintained throughout, values continue steady and firm. Current quotations :—*Ordinary* : Thursday, £32 2s. 6d. ; Friday, £32 2s. 6d. ; Tuesday, £32 2s. 6d. ; Wednesday, £32 1s. 3d.

Lead.—In the case of soft foreign pig, conditions of supply have not been quite so favourable as other metals, and many cargoes remained unloaded in docks until the termination of the trouble. In fact, the metal that has arrived at port had not been moved up to the 15th inst., as it had been considered that food supplies and other necessities should have first call on police protection. There has been quite a fair business doing in futures, but for spot metal the call has been necessarily small in consequence of the difficulty of transport. Current quotations :—*Soft foreign (prompt)* : Thursday, £28 8s. 9d. ; Friday, £28 10s. ; Tuesday, £28 10s. ; Wednesday, £28 8s. 9d.

SILICA

We look forward to seeing our friends at The Agricultural Hall. Stand 3. Row G.

SYDNEY EVANS, 9, BUSH LANE, CANNON ST., LONDON, E.C.4.



40 Years' Experience in the Design & Construction of Fans

for

Heating and Ventilation of Buildings, Mines and Ships,
High Pressure Blast for Forges, Furnaces and Cupolas,
Mechanical Boiler Draught,
Fume and Steam Removal,
Dust Removal and Collection,
Cooling and Drying Plants

means **Expert Knowledge, High Efficiency, Reliability & Good Service**

Davidson's the TRADE SIROCCO MARK Fan Makers

have an experience covering hundreds of different industries and hundreds of different uses, and they can furnish a Sirocco Fan for every purpose for which a fan can be employed.

Solve your fan problems by using the Sirocco Service.

DAVIDSON & Co. LIMITED

SIROCCO ENGINEERING WORKS - BELFAST

LONDON - BIRMINGHAM - CARDIFF - BRISTOL MANCHESTER - GLASGOW - NEWCASTLE

BLACKING,
PLUMBAGO,
CORE GUM,
WHITE DUST,
COAL DUST.

ESTABLISHED 1863

JAS. DURRANS & SONS, LTD.

PHOENIX WORKS, PENISTONE, near SHEFFIELD.

Telephone:
21 PENISTONE.

Telegrams:
"DURRANS, PENISTONE."

Manufacturers of

FOUNDRY EQUIPMENTS

LADLES,
FIRE BRICKS,
STONE FLUX,
CASTING CLEANERS,
PIPE NAILS,
SPRIGS,
WIRE BRUSHES,
BELLOWS,
CUPOLAS,
GANISTER,
LOAM AND SAND MILLS,
STUDS,
CHAPLETS,
BRUSHES,
CORE ROPES.
BUCKETS,
SPADES, Etc.

Write for Illustrated Catalogue on Blacking and Foundry Requisites, also for our latest Price List.

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash ..	56	5	0
Three months ..	57	2	6
Electrolytic	64	5	0
Tough	59	10	0
Best selected ..	60	0	0
Sheets	90	0	0
India	74	0	0
Wire bars	64	10	0
Do. May	64	5	0
Do. June	64	5	0
Ingot bars	64	5	0
H.C. wire rods ..	68	15	0
Off. av. cash, Apr.	57	5	2¼
Do., 3 mths. Apr.	58	2	3
Do., Sttlmnt, Apr.	57	5	0
Do., Electro, Apr.	64	16	7½
Do., B.S., Apr. ..	61	1	4⅝
Aver. spot price copper, Apr. ..	57	5	0
Do., wire bars, Apr.	65	1	3
Solid drawn tubes		12¾d.	
Brazed tubes ..		12¾d.	
Wire		9½d.	

BRASS.

Solid drawn tubes ..	11¾d.
Brazed tubes	13¾d.
Rods, drawn	10¾d.
Rods, extd. or rlld. ..	7¾d.
Sheets to 10 w.g ..	10¾d.
Wire	9¾d.
Rolled metal	9¾d.
Yellow metal rods ..	7¾d.
Do. 4 × 4 Squares	8d.
Do. 4 × 3 Sheets ..	8¼d.

TIN.

	£	s.	d.
Standard cash ..	268	0	0
Three months ..	268	0	0
English	265	15	0
Bars	268	5	0
Straits	277	15	0
Australian	269	12	6
Eastern	271	0	0
Banca	270	10	0
Off. aver. cash, Apr.	281	10	6
Do., 3 mths., Apr.	271	0	10½
Do., Sttlmt. Apr.	281	9	9
Aver. spot., Apr.	281	9	9

SPELTER.

	£	s.	d.
Ordinary	32	1	3
Remelted	32	5	0
Hard	26	15	0
Electro 99.9 ..	35	15	0
English	32	15	0
India	29	5	0
Zinc dust	42	0	0
Zinc ashes	14	0	0
Off. aver., Apr. ..	32	13	7½
Aver., spot, Apr.	32	10	0¾

LEAD.

	£	s.	d.
Soft foreign ppt.	28	8	9
English	30	0	0
Off. average, Apr.	29	0	7½
Average spot, Apr.	28	15	6

ZINC SHEETS, &c.

Zinc sheets, English	41	0	0
Do. V.M. ex whf.	38	0	0
Rods	44	0	0
Boiler plates ..	38	10	0
Battery plates ..	38	0	0

ANTIMONY.

Special brands, Eng.	89	10	0
Chinese	62	0	0
Crude	42	0	0

QUICKSILVER.

Quicksilver ..	15	5	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon			
25%	9	10	0
45/50%	11	5	0
75%	20	0	0
Ferro-vanadium—			
35/40% 14/6 to 15/- lb. va.			
Ferro-molybdenum—			
70/75% c. free	6/3 lb.		
Ferro-titanium—			
23/25% carbonless	11½d. lb.		
Ferro-phosphorus, 20/25%,	£17	0	0
Ferro-tungsten—			
80/85%, c.fr. ..	1/7¾ lb.		
Tungsten metal powder—			
98/99%	2/- lb.		
Ferro-chrome—			
2/4% car. ..	£33	10	0
4/6% car. ..	£22	5	0
6/8% car. ..	£21	15	0
8/10% car. ..	£20	17	6
Ferro-chrome—			
Max. 2% car.	£37	0	0
Max. 1% car.	£43	10	0
Max. 0.70% car.	£54	10	0
70%, carbonless	1/5½ lb.		
Nickel—99%,			
cubes or pellets ..	£170		
Cobalt metal—98/99%	10/- lb.		
Aluminium 98/99%	£112		
Metallic Chromium—			
96/98% ..	3/3 lb.		
Ferro-manganese (net)—			
76/80%, loose	£15	0	0
76/80%, packed	£16	0	0
76/80%, export	£14	5	0
Metallic manganese—			
94/96%, carbonless	2/- lb.		

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten ..	2	6
Finished bars, 18% tungsten ..	3	0

Per lb. net, d/d buyers' works.

Extras—
Rounds and squares 3 in. and over .. 4d. lb.
Rounds and squares under ½ in. to ¼ in. 3d. lb.
Do. under ¼ in. to ⅛ in. .. .. 1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in. 3d. lb.
Do. under ½ in. × ¼ in. 1/- lb
Bevels of approved sizes and sections 6d. lb.
Bars cut to length 10% extra

Scrap from high-speed tool steel—
Scrap pieces .. .. 3d.
Turnings and swarf 1d.

Per lb. net, d/d steel makers' works.

SCRAP.

	£	s.	d.	£	s.	d.
South Wales—						
Hvy. steel	3	7	6	to 3	10	0
Bundled steel & shrngs.	3	3	0	to 3	6	0
Mixed iron & steel	3	0	0	to 3	2	6
Heavy cast iron	3	2	6	to 3	5	0
Good machinery for foundries ..	3	7	6			
Cleveland—						
Heavy steel	3	1	to	3	2	0
Steel turnings ..	2	5	0			
Cast iron borings	2	4	0			
Heavy forge ..	4	0	0			
Bushelled scrap	3	7	6			
Cast-iron scrap	3	5	0			
Lancashire—						
Cast-iron scrap	3	5	to	3	10	0
Hvy. wrought ..	3	5	0			
Steel turnings ..	2	2	0			

London — Merchants' buying prices delivered yard.

Copper (clean)..	48	0	0
Brass (clean) ..	38	0	0
Lead (less usual draft)	25	10	0
Tea lead ..	21	0	0
Zinc	21	0	0
New aluminium cuttings ..	80	0	0
Braziery copper	44	0	0
Gunmetal ..	44	0	0
Hollow pewter	170	0	0
Shaped black pewter ..	126	0	0

PIG-IRON.

(f.o.t. unless otherwise stated).

N.E. Coast—	
Foundry No. 1 ..	75/-
Foundry No. 3 ..	72/6
Foundry No. 4 ..	71/6
Forge No. 4	71/-
Hematite No. 1 ..	78/-
Hematite M/Nos. ..	77/6
N.W. Coast—	
Hem. M/Nos. d/d Glas.	86/3
„ d/d Birm.	92/3
Midlands—	
Staffs common* ..	—
„ No. 4 forge ..	62/6
„ No. 3 foundry	67/6
Shrops. basic	70/-
„ Cold blast, ord.*	185/-
„ „ roll iron* ..	190/-
* d/d Birmingham.	
Northants forge	—
„ fdry No. 3 ..	65/-
Derbyshire forge ..	—
„ fdry. No. 3 ..	70/-
„ basic	65/-
Scotland—	
Foundry No. 1 ..	81/-
„ No. 3 ..	76/-
Hem. M/Nos.	76/-
Sheffield (d/d district)—	
Derby forge	—
„ fdry. No. 3 ..	74/-
Lincs. forge	67/6
„ fdry. No. 3 ..	70/-
E.C. hematite	89/6
W.C. hematite ..	89/-
Lincs. (at furnaces)—	
Forge No. 4	61/6
Foundry No. 3.. ..	64/-
Basic	63/-
Lancashire (d/d eq. Man.)—	
Derby forge	—
„ fdry. No. 3 ..	77/6
Northants foundry No. 3	76/-
Dalzell, No. 3	110/-
Summerlee, No. 3 ..	93/6
Glengarnock, No. 3 ..	93/6
Gartsherrie, No. 3 ..	93/6
Monkland No. 3	93/6
Coltness, No. 3	93/6
Shotts, No. 3	93/6

FINISHED IRON & STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.	£	s.	d.
Bars(cr.)	11	0	0	to 12	0	0
Angles	11	10	0			
Tees to 3 united ins.	12	0	0			
Nut and bolt	10	5	0	to 10	7	6
Hoops	14	0	0	to 15	0	0
Marked bars (Staffs.) f.o.t. ..	14	0	0			
Gas strip	12	10	0			
Bolts and nuts ¾ in. × 4 in. ..	15	5	0			
Steel—						
Ship plates	7	12	6	to 7	17	6
Boiler plts. ..	11	5	0			
Chequer plts. ..	9	15	0			
Angles	7	2	6			
Tees	8	2	6			
Joists	7	2	6			
Rounds and Squares 3 in. to 5½ ins. ..	7	15	0			
Rounds under 3 in. to ¾ in.	7	10	0			
Flats, over 5 in. wide and up ..	8	5	0			
Flats, 5in. to 1½in.	7	5	0			
Rails, heavy ..	8	0	0			
Fishplates	12	0	0			
Hoops (Staffs.) ..	10	10	0			
Black sheets, 24g.	10	17	6			
Galv. cor. sheets, 24g.	15	5	0	to 15	10	0
Galv. fencing wire 8g. plain	13	0	0			
Billets, soft	£6	2	6	to 6	5	0
Billets, hard	—	8	2	6		
Sheet bars	6	0	0	to 6	2	6
Tin bars d/d	6	2	6	to 6	5	0

PHOSPHOR BRONZE.

	Per lb.	basis.
Strip	1	3
Sheet to w.g.	1	3½
Wire	1	3½
Rods	1	3
Tubes	1	8
Castings	1	2

Delivery 3 cwt. free
10% phos. cop. £40 above B.S.
15% phos. cop. £50 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	9d. to 1/3
Rolled—	
To 9 in. wide	1/3 to 1/9
To 12 in. wide	1/3½ to 1/9½
To 15 in. wide	1/3½ to 1/9½
To 18 in. wide	1/4 to 1/10
To 21 in. wide	1/4½ to 1/10½
To 25 in. wide	1/5 to 1/11
Ingots for spoons and forks ..	9d. to 1/5½
Ingots rolled to spoon size ..	1/- to 1/8½
Wire round—	
3/0 to 10 G.	1/6½ to 2/1½

with extras according to gauge.

AMERICAN IRON & STEEL.

At Pittsburgh unless otherwise stated.	Dols.
No. 2X foundry, Phila.	22.76
No. 2 foundry, Valley	20.76
No. 2 foundry, Birm.	22.00
Basic	20.26
Bessemer	21.26
Malleable	20.76
Grey forge	20.26
Ferro-mang. 80% d/d	88.00
Bess. rails, h'y, at mill	43.00
O.-h. rails, h'y at mill	43.00
Bess billets	35.00
O.-h. billets	35.00
O.-h. sheet bars ..	36.00
Wire rods	45.00
	Cents.
Iron bars, Phila. ..	2.22
Steel bars	2.00
Tank plates	1.85
Beams, etc.	1.90
Skelp, grooved steel ..	1.90
Skelp, sheared steel ..	1.90
Steel hoops	2.50
Sheets, black, No. 28..	3.15
Sheets, galv., No. 28 ..	4.40
Sheets, blue an'l'd, 9 & 10	2.40
Wire nails	2.65
Plain wire	2.50
Barbed wire, galv. ..	3.35
Tinplate, 100 lb. box	$5.50

COKE (at ovens).

Welsh foundry ..	32/6 to 40/-
„ furnace ..	20/- to 25/-
Durham & North.	
„ foundry	30/- to 33/-
„ furnace	14/- to 14/6
Other Districts, foundry	30/- to 33/-
„ „ furnace (basis)	11/9

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. Cokes, 20×14, box		19/4½
„	28×20, „	38/9
„	20×10, „	29/-
„	18¾×14, „	20/1½
C.W.	20×14, „	17/10½
„	28×20, „	36/1½
„	20×10, „	24/3
„	18¾×14, „	18/10½

Terneplates 28×20, 36/- per box basis f.o.b.

SWEDISH IRON.

Bars, hammered	£18/10 to £19/0
Rolled Ord.	£15/15/0 to £16/5/0
Nail rods	£16 5 0 to £16 15 0
Keg. steel nom.	£33 to £35
Faggot steel nom.	£22 to £25
Blooms, according to quality	£9 to £12
Pig-iron	£6 5 0 to £7 0 0

all f.o.b. Gothenburg.

TUBES AND FITTINGS.

Up to and incl. 6 in.

	Tubes	*Fittings*
Gas	60%	50%
Water	55%	45%
Steam	50%	40%

W.I. 10% extra.

DAILY FLUCTUATIONS.

Standard Copper (Cash).

	£	s.	d.	
May 20	56	5	0	dec. 2/6
,, 21	56	5	0	No change
,, 25	56	5	0	,, ,,
,, 26	56	5	0	,, ,,

Electrolytic Copper.

	£	s.	d.	
May 20	64	5	0	No change
,, 21	64	5	0	,, ,,
,, 25	64	5	0	,, ,,
,, 26	64	5	0	,, ,,

Standard Tin (Cash).

	£	s.	d.	
May 20	267	5	0	dec. 15/-
,, 21	266	15	0	,, 10/-
,, 25	268	15	0	inc. 40/-
,, 26	268	0	0	dec. 15/-

Tin (English ingots).

	£	s.	d.	
May 20	265	0	0	dec. 15/-
,, 21	264	5	0	,, 15/-
,, 25	266	5	0	inc 40/-
,, 26	265	15	0	dec. 10/-

Zinc Sheets (English).

	£	s.	d.	
May 20	41	0	0	No change
,, 21	41	0	0	,, ,,
,, 25	41	0	0	,, ,,
,, 26	41	0	0	,, ,,

Spelter (ordinary).

	£	s.	d.	
May 20	32	2	6	No change
,, 21	32	2	6	,, ,,
,, 25	32	2	6	,, ,,
,, 26	32	1	3	dec. 1/3

Lead (English).

	£	s.	d.	
May 20	30	0	0	No change
,, 21	30	0	0	,, ,,
,, 25	30	0	0	,, ,,
,, 26	30	0	0	,, ,,

AVERAGE MONTHLY PRICES OF STEEL BOILER PLATES IN ENGLAND.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1895	5 15 0	5 15 0	5 12 6	5 12 6	5 15 0	5 17 6	5 15 0	5 17 6	6 0 0	6 0 0	6 2 6	6 0 0	5 16 10½
1896	6 0 0	6 0 0	6 2 6	6 2 6	6 2 6	6 0 0	6 0 0	6 0 0	6 0 0	6 2 6	6 10 0	6 10 0	6 2 6
1897	6 10 0	6 10 0	6 10 0	6 7 6	6 2 6	6 2 6	6 5 0	6 0 0	6 0 0	6 0 0	6 7 6	6 10 0	6 5 5
1898	6 10 0	6 8 9	6 8 9	6 10 0	6 15 0	6 18 9	6 17 6	6 17 6	7 2 6	6 15 0	7 0 0	7 5 0	6 15 8¾
1899	7 5 0	8 0 0	8 2 6	8 2 6	8 5 0	8 5 0	8 12 6	8 12 6	8 15 0	8 15 0	9 2 6	9 5 0	8 17 8½
1900	9 5 0	9 5 0	9 7 6	9 10 0	9 12 6	10 5 0	10 5 0	10 5 0	10 5 0	10 0 0	9 15 0	9 15 0	9 15 10
1901	9 5 0	9 5 0	8 15 0	8 10 0	8 10 0	7 10 0	7 15 0	7 15 0	7 15 0	7 15 0	7 15 0	7 15 0	8 3 11
1902	7 7 6	7 0 0	7 12 6	7 12 6	7 12 6	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 9 7
1903	7 10 0	7 10 0	7 15 0	7 5 0	7 5 0	7 5 0	7 5 0	7 0 0	7 0 0	7 0 0	7 0 0	6 17 6	7 3 11½
1904	6 12 6	6 15 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	6 18 11½
1905	6 17 6	6 17 6	6 17 6	6 17 6	6 17 6	6 17 6	6 17 6	6 17 6	6 10 0	7 5 0	8 0 0	8 0 0	7 1 3
1906	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 10 0	8 0 10
1907	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 10 0	8 0 0	8 0 0	8 8 4
1908	7 10 0	7 10 0	7 10 0	7 5 0	7 5 0	7 5 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	7 3 9
1909	7 0 0	7 0 0	7 0 0	7 0 0	7 0 0	6 15 0	6 15 0	6 15 0	7 0 0	7 0 0	7 0 0	7 0 0	6 18 9
1910	7 0 0	7 0 0	7 1 3	7 5 0	7 5 0	7 5 0	7 5 0	7 5 0	7 5 0	7 10 0	7 10 0	7 10 0	7 5 1
1911	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 10 0	7 14 0	7 10 4
1912	7 18 9	8 0 0	8 0 0	8 7 6	8 10 0	8 10 0	8 10 0	8 15 0	8 16 3	9 0 0	9 2 0	9 5 0	8 11 2½
1913	9 5 0	9 5 0	9 5 0	9 5 0	9 5 0	9 5 0	9 5 0	8 19 0	8 15 0	8 5 0	7 15 0	7 15 0	8 17 0
1914	7 15 0	7 15 0	7 15 0	7 13 9	7 10 6	7 5 0	7 0 0	8 0 0	8 2 6	8 5 0	8 5 0	8 5 0	7 15 11½
1915	8 14 0	9 10 0	9 17 6	10 10 0	10 10 0	11 0 0	11 0 0	11 0 0	11 0 0	11 4 0	12 0 0	13 0 0	10 15 5½
1916	13 0 0	13 0 0	13 0 0	12 15 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 12 11
1917	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0
1918	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0	12 10 0
1919	13 0 0	15 0 0	15 0 0	15 0 0	19 5 0	19 17 6	21 0 0	21 10 0	21 10 0	21 10 0	21 15 0	23 10 0	18 9 9
1920	26 0 0	28 0 0	28 5 0	28 10 0	29 5 0	30 0 0	30 0 0	30 0 0	30 10 0	31 0 0	31 0 0	31 0 0	29 9 2
1921	30 5 0	29 0 0	25 0 0	25 0 0	25 0 0	23 0 0	21 0 0	20 10 0	19 0 0	17 10 0	16 0 0	14 16 0	22 1 9
1922	14 10 0	14 10 0	14 10 0	14 10 0	14 10 0	13 1 8	13 10 0	12 15 0	12 10 0	12 10 0	12 10 0	12 6 0	13 10 9
1923	12 8 9	13 6 0	14 0 0	14 0 0	14 0 0	14 0 0	13 12 6	13 0 0	13 0 0	13 0 0	13 0 0	13 10 0	13 9 1½
1924	13 10 0	13 10 0	13 10 0	13 10 0	13 10 2	13 10 0	13 10 0	14 0 0	14 0 0	13 11 0	13 5 0	13 5 0	13 10 11
1925	13 5 0	13 5 0	13 5 0	13 1 0	12 15 0	12 15 0	12 15 0	12 15 0	12 7 6	11 14 0	11 10 0	11 10 0	12 11 5½
1926	11 10 0	11 10 0	11 10 0	11 5 0	—	—	—	—	—	—	—	—	—

WILLIAM JACKS & COMPANY,

WINCHESTER HOUSE, OLD BROAD ST., LONDON, E.C.2.

18, BENNETTS HILL, BIRMINGHAM.

18, BENNETTS HILL, BIRMINGHAM.
11, OLD HALL STREET, LIVERPOOL.
EXCHANGE BLDGS., PORT TALBOT.
FOWLERS BUILDINGS, BOMBAY.
CLIVE STREET, CALCUTTA.
ANGAPPA NAICK STREET, MADRAS.

REGISTERED TRADE MARK

1, HONG KONG ROAD, SHANGHAI.
OCEAN BUILDING, SINGAPORE.
JAVA STREET, KUALA LUMPUR
5, SHAFFRAZ ROAD, RANGOON.
COX'S BUILDINGS, KARACHI.
P.O. BOX 1580, CAIRO.

PIG IRON

SCOTCH, MIDDLESBRO', HEMATITE, BASIC, SPECIALS, &c.,

NON-FERROUS METALS

COPPER, TIN, LEAD, SPELTER, ANTIMONY, CHROME ORE

WILLIAM JACKS & COMPANY,

93, HOPE STREET, GLASGOW.

ROYAL EXCHANGE, MIDDLESBROUGH.

SITUATIONS VACANT AND WANTED.

PRACTICAL Steel Foundry Metallurgist desires position; could erect successful small steel plant, or invest limited amount with small firm; present position Steel Foundry Manager.—Box 714, Offices of THE FOUNDRY TRADE JOURNAL, Bessemer House, 5, Duke Street, Adelphi, London, W.C.2.

LIVE MAN seeks position as Foundry Foreman, any part of England; 10 years' experience in foundry management, costing and rate fixing, on light and heavy, loam and sand; economic cupola practice a speciality.—Reply, Box 720, Offices of THE FOUNDRY TRADE JOURNAL, Bessemer House, 5, Duke Street, Adelphi, London, W.C.2.

FIRST-CLASS MOULDER seeks job with a view to a permanency; any class of work; preferably heavy loam and dry sand work on piecework or bonus; non-Soc.—Reply, Box 722, Offices of THE FOUNDRY TRADE JOURNAL, Bessemer House, 5, Duke Street, Adelphi, London, W.C.2.

JIM.—Any Foundryman who considers himself like Jim in face and figure will hear of something to his advantage if he will write to THOMAS H. GRAY, 119, High Holborn, London, W.C.

SALE BY TENDER.

BY ORDER OF THE COURT.

FOR SALE BY TENDER AS A GOING CONCERN, OR ALTERNATIVELY IN LOTS.

MESSRS. JOHN CROWLEY & COMPANY, LIMITED (IN LIQUIDATION), MEADOW HALL IRON WORKS, WINCOBANK, SHEFFIELD.

THE FREEHOLD LAND and BUILDINGS, comprising MALLEABLE and CAST IRON FOUNDRIES and ENGINEERING SHOPS of over 145,000 square feet floor area.

THE FIXED PLANT and MACHINERY, THE LOOSE PLANT, TOOLS, IMPLEMENTS OF TRADE, OFFICE FURNITURE and FITTINGS, THE STORES, MATERIAL, STOCK IN TRADE, WORK IN PROGRESS, and SALEABLE STOCK.

THE GOODWILL OF THE BUSINESS, which has been established over 100 years, including patterns, models, and drawings. The Works are at present equipped with Plant capable of producing approximately 55 TONS OF MALLEABLE IRON CASTINGS AND 50 TONS OF LIGHT CAST IRON CASTINGS PER WEEK.

THE SITE AREA OF THE WORKS IS ABOUT 11 acres, part of which is available for extensions, and there is a supply of water for trade purposes from an adjoining brook. The Works adjoin and have connections with the L.M. & S. and L.N. & E. Railways and are near two stations and a 'bus route.

ALSO THE VACANT FREEHOLD TIPPING OR BUILDING LAND, comprising about 11½ acres, with extensive frontages to Newman Road and Fife Street, near the Works.

Further Particulars, including Schedules of the Fixed Plant and Machinery, etc., may be obtained from :—

Mr. J. W. Merryweather, F.C.A., Church Street, Sheffield.
Mr. G. S. Greening, F.C.A., 18, Norfolk Row, Sheffield.
} Joint Receivers and Managers.

Mr. C. Turner, F.C.A., 155, Norfolk Street, Sheffield, Liquidator.

Messrs. Webster & Company, Solicitors, 5, Leopold Street, Sheffield.

Messrs. R. Heber Radford, Son & Squire, Consulting Engineers and Valuers, 15, St. James Row, Sheffield.

PUBLICATIONS.

IRON, STEEL, BRASS AND ALUMINIUM FOUNDERS, MANUFACTURING ENGINEERS, MAKERS OF FOUNDRY PLANT AND REQUISITES, REFRACTORIES

The 1926 Edition of "RYLAND'S," now on sale, covers all branches of these industries, in addition to many others. Order your Copy now. Price 42s. cloth, 52s. morocco. EAGLAND & CO., LTD., Bessemer House, Duke Street, Adelphi, London, W.C.2.

PATENTS.

PATENT YOUR INVENTIONS, Trade-mark your Goods. Advice, Handbook and Cons. free.—B. T. KING, C.I.M.E. (Regd. Pat. Agent, G.B., U.S.A., and Can.), 146A, Queen Victoria Street, E.C.4. 38 years' refs. 'Phone 682 Central.

THE Proprietors of the Patent No. 207,460 for Apparatus for Distillation of Solid Materials are desirous of entering into arrangements by way of licence and otherwise on reasonable terms for the purpose of exploiting the same and ensuring its full development and practical working in this country.—All communications should be addressed in the first instance to HASELTINE LAKE & COMPANY, Chartered Patent Agents, 28, Southampton Buildings, Chancery Lane, London, W.C.2.

MACHINERY

FOR SALE, one 400-lb. Morgan Oil Fired Tilting Furnace, good condition, with Blower, Tank, and necessary Piping; also about 50 Pots for same.—Apply, THE FORDATH ENGINEERING COMPANY, LIMITED, Hamblet Works, West Bromwich.

SAND MIXERS.—New and second-hand. Ask us to quote.—W. BREALEY & COMPANY, LIMITED, Prospect Works, Hawksley Avenue, Sheffield.

PRACTICALLY new "Tilghman" sandblast room plant for immediate sale at sacrifice price; working chamber 12 ft. x 9 ft.; complete with latest type compressor and all apparatus, including filter.—Box 718, Offices of THE FOUNDRY TRADE JOURNAL, Bessemer House, 5, Duke Street, Adelphi, London, W.C.2.

MISCELLANEOUS.

LETTERS AND FIGURES for Patterns; all sizes; Aluminium; die cast, with pins in one piece; no shellac needed; simply drive them in and they cannot come off. Send for samples and prices.—A. LAKIN & SON, Totley Rise, Sheffield.

PATTERNS.—Inquiries solicited; quotations by return; shop equipped with modern machinery; quick delivery.—CLEGHORN & COMPANY, Midland Pattern Works, Spring Gardens, Worcester. Phone 264.

TERRA FLAKE, best white quality. Ask for samples and prices.—LAWSON, WALTON & CO., LTD., Newcastle/Tyne.

FOUNDRY BRUSHES, all kinds; Steel Wire Brushes, Tube Brushes, and Boiler Scale Brushes.—WILLIAM OLSEN, LIMITED, Cogan Street, Hull.

HAVE YOU HAD YOUR COPY?—FREE!

A Handbook of Practical Information for
FOUNDRYMEN AND ENGINEERS

Published by:—
BEECROFT & PARTNERS, Ltd., ST. PETER'S CLOSE, SHEFFIELD
(Consulting Metallurgical and Foundry Chemists)
Sent post free upon written application

TILTING FURNACES.

150 lb. M.R.V. Cokefired, NEW	£40
250 lb. MORGAN Cokefired	£48
200 lb. MORGAN Gasfired	£28
600 lb. MORGAN Cokefired	£65

I have in Stock ALL sizes of Fans and Blowers.

NEW LADLES—CHEAP.

12 Ton EVANS	£85
5 Ton McNEIL	£38
2½ Ton by GEORGE GREEN	£30
2 Ton THWAITES	£26
1½ Ton EVANS (Secondhand)	£19

BUY FROM ME AND SAVE MONEY.

ALEX. HAMMOND. *FOUNDRY MACHINERY MERCHANT.*
14, AUSTRALIA ROAD, SLOUGH.